American
GAS JOURNAL
Formerly American Gas Light Journal
EST. 1859

Vol. 118. No. 21.
WHOLE NO. 2467.

NEW YORK, SATURDAY, MAY 26, 1923

Subscription $3 per year
$4 Canada $5 Foreign

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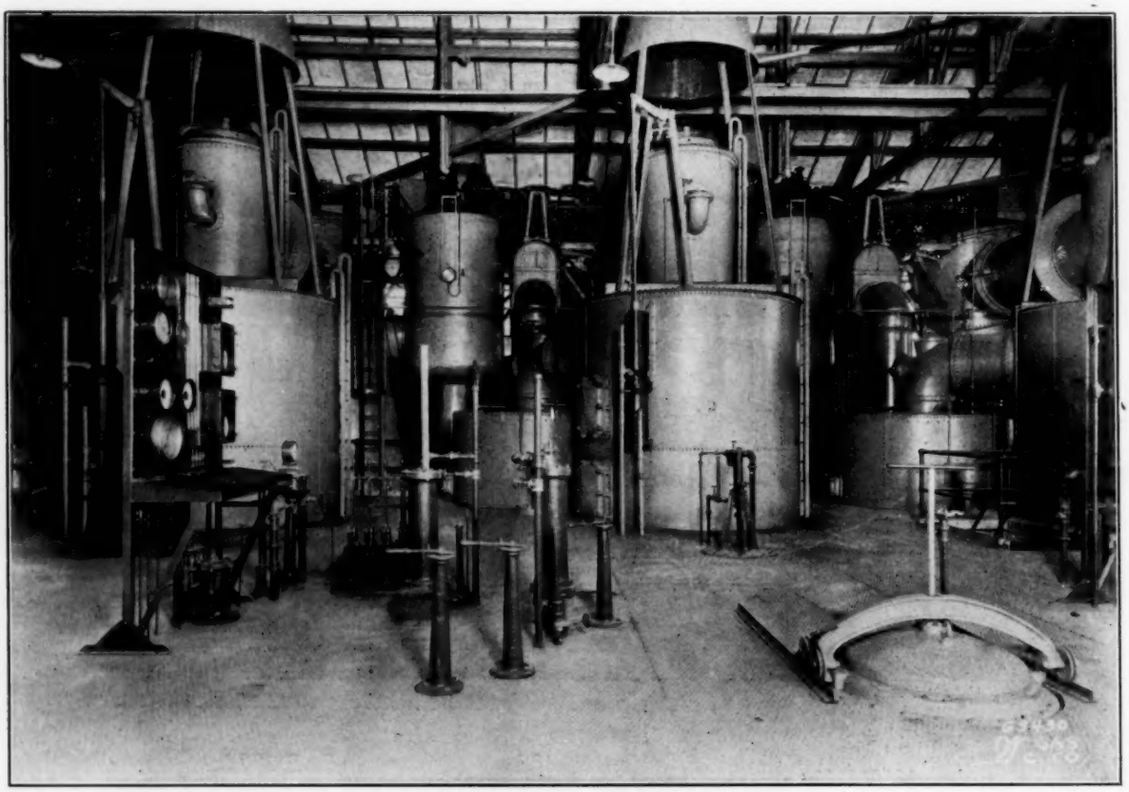

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SIXTY-THIRD YEAR

Published Weekly by American Gas Light Journal, Inc., 53 Park Place, New York, N. Y.

ELBERT P. CALLENDER, Pres. S. G. KRAKE, Vice-Pres.-Treas. A. M. GLEASON, Sec'y.

STANTON G. KRAKE, Managing Editor

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Subscription $3.00 per year, including postage, in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines; in Canada, $4.00; foreign, $5.00—Single Copies, 10 cents.

AMERICAN GAS JOURNAL, May 26, 1923. Vol. 118, No. 21.
Published weekly by American Gas Light Journal, Inc., New York, N. Y.
Entered as second-class matter Jan. 9, 1917, at the post-office at New York, N. Y., under the Act of March 3, 1879.

American Gas Journal
Formerly American Gas Light Journal

Vol. 118. No. 21 NEW YORK, MAY 26, 1923 Whole No. 3407

Public Relations of Public Utilities

Functions of Public Utilities Explained—Utilities Must Grow Constantly to Warrant Their Existence. Causes of Undue Interference Described and Remedies for Same Discussed. Public Ownership of Utility Stock Advocated.

By H. C. Abell

The following address was delivered before the joint session of the Southwestern Public Service Association and South Central Gas Association at Fort Worth, Texas, May 16, 1923:

It takes up in detail a subject which has received much attention, the undue interference into the affairs of public service companies, but it goes further than most such discussions by outlining a plan of operation for educating the public to the real facts of the matter, so that unfounded, injurious prejudice against public utilities may be removed. It is interesting to note that the participation of the public in the ownership of the companies is advocated.

It has been shown that early in the human history people grouped together for mutual advantage and protection. As the world became more thickly populated and the mechanical arts developed, it became necessary for humanity to form into communities, which have constantly grown in size. With the increased growth it was found necessary to provide large quantities of water, then came the sewage disposal problem, and later gas, transportation, electric light and power, telephone, heat, etc. Each individual could not furnish himself with these facilities at the cheapest rate and of the best quality and most conveniently. The Public Utility was then born of necessity.

The meaning of the words "Public Utility" is:

PUBLIC—Pertaining to, or affecting, the people at large, or of the community.

UTILITY—The quality, character or state of being useful or serviceable.

A business affected with the public interest—a business whose services are intimately related to the welfare of the community which it serves, which shows that they are necessities and are the actual spinal cords of the communities. It would be impossible for each individual to furnish himself with telephone service which could not have a radius of use much outside the confines of his own domicile, it would also be just as difficult for him to supply himself economically in small quantities, light, transportation, modern methods of obtaining heat for household necessities, etc.

Public utilities are so interwoven with human affairs—domestically and industrially—that the question of their necessity is axiomatic. In fact, they have become the prime necessities of life. Admitting the foregoing statement to be true, I think it will logically follow that the Utilities must increase their facilities as the communities grow.

Public Utilities Can Never Stop Growing

They have become such a necessary part of urban life that human existence and the growth of the community are impossible without their presence. They furnish the necessities of the very life of the community. They are the servant to the housewife, the tools of the artisan, the allies of industry, and a silent partner of every individual in the community. Even though a community should not grow, if such a place existed, the uses of the utilities product are increasing each day, and it is the obligation of the utility to serve without favor, and to add to the convenience, health and safety of the people.

What Must Be Done to Permit Utilities to Grow?

Public utilities differ from other commercial and industrial enterprises, requiring relatively very large amounts of capital with which to provide means to pay for their expansion, in that utilities cannot finance out of surplus earnings. The funds must of necessity be obtained from many sources because money cannot be derived from the earnings after payment of the out-of-pocket operating expenses and taxes, and a fair return upon the capital invested. The yearly annual gross receipts are very small compared to the capital outlay. An investment of four to five dollars or more per dollar of annual gross receipts is about the average. When it is considered that under good management of well and economically operated public utilities it requires 60 to 70 cents out of every dollar received from the sale of its product to pay operating expenses, taxes and renewal replacements, and that only 30 to 40 cents are left to pay the investor for the use of his four or five dollars, it is then self-evident that the investment cannot be built up out of surplus earnings.

It is a known fact that public utilities can only grow as additional capital is provided by both the small and large investor. In order to obtain the thirty or forty cents out of each dollar of gross revenue to pay for the use per year of four or five dollars, the utility must be prosperous, and to be prosperous the treatment and attitude of the public

must be first class. Drastic franchise obligations must be modified. Rate of charge should not be fixed for a period of years any more than the price to be paid for bread and meat should be permanently fixed. Newspapers and the public may be curious for the facts, but they should not be suspicious. Criticism, when a utility is considered as a public servant, is invited, but should not be averse to the utilities welfare unless deserved.

Under regulation the interest of the public and the utility are mutual. There should be rewards for initiative and efficiency. Regulating bodies must be courageous and must not permit political expediency nor public prejudice to dictate. They must be enlightened and have a sympathetic feeling, but must not assume the prerogatives, of a general manager. The public's greatest interest is adequate and proper service at a fair price, but price should have a secondary consideration just so long as the value of the service is not exceeded. The accumulation of a stabilizing surplus should be permitted with which to insure at all times proper and continuous payment to owners of capital for its use. The adequacy of earning power is necessary to attract capital when in competition for its hire. The best interest is served when utilities are made strong, live and dependable. The utilities should be made responsible by working with them, not against them, and some appreciation should be shown when the results reflect the effort put forth.

Causes for Interference with Public Service Corporations

First: The reputed history of some of the early public utilities relative to obtaining franchises, the throttling of threatened competition, the pyramiding of capital outstanding, and statements concerning the tactics which were supposed to have been undertaken in order to accomplish the desired end, still remain in the public mind in a prejudicial way.

Second: The fact that a utility is a public servant, and a necessity, undoubtedly has a tendency to make people non-appreciative and disposed to demand the service at the lowest price when compared to the price paid in other communities, irrespective of the difference in costs and conditions.

Third: The theory that a public utility is an agent of the city and is performing a function which the city itself might undertake is frequently misunderstood. Being considered an agent of the city, it is sometimes imagined that the utility should be able to finance as cheaply as the city. No consideration is given to the fact that:

(a) The city can only finance cheaply to the extent of its credit and based on its ability to raise money through taxes.

(b) If money were obtained by the city without the city's credit back of the loan, and the only security which could be offered would be the earnings of the utility to be financed and then under the conditions which the city imposes on the utility, the cost to obtain money would then be on a comparable basis with the cost of public utility financing.

Fourth: The ignorance of the general public relative to any of the utilities' many, varied and intricate problems tends to make the public non-sympathetic and the further fact that an utility is a monopoly which it should be, when regulated, and is styled a corporation. When it is fairly prosperous some persons are prone to suggest that the prosperity is at the expense of the public.

Fifth: The bad treatment of the public by some utilities and poor service which is sometimes furnished will immediately react detrimentally.

Sixth: Drastic franchise obligations entered into during a period of the past which could not now be lived up to by an utility; and a request for relief gives the demagogue an opportunity to holler aloud "abrogating contract."

A public utility is today in a rather vulnerable position in that it is possible for an ambitious and unscrupulous politician to attack it. It is also susceptable to serious and almost irreparable damage from adverse and unfair attacks and unregulated competition, therefore, it behooves every public utility to set its house in order, that is, to make its public relations right.

I think that a public utility's first requirement is to obtain and to retain a proper feeling toward it by its patrons and the public. It cannot finance and continue to give good and adequate service when its rates of charge, its standard of service, and its very existence is constantly attacked.

A public utility cannot pull up stakes and go to another locality and start all over, the same as can be done by almost any commercial or industrial undertaking; it is therefore essentially at a very great disadvantage.

The Public Must Be Educated

It is possible for a utility to get its house in order, in the public mind, only by education. To illustrate how this arduous and difficult task might be undertaken I will consider an hypothetical case of a utilty in a precarious condition, and will show how it might be resuscitated.

First: The operators must have faith that the obituary has not actually occurred and that the apparent deceased can be revived. It is necessary to have every employee believe that there will be a resuscitation, and that the future strength and vitality of the utility will be in direct proportion to the effort put forth by each employee.

A utility is known by the personnel of its employees. The employee of a utility is to many persons the utility itself. Unfortunately, this fact is often lost sight of. Educate the employee to believe and have faith in the utility and teach him that the work he is performing is part of one of the most important undertakings in the community. It is not necessary for each employee to have an intimate knowledge of the intricate details of a utility business outside of his department, but only a general knowledge of the important and necessary functions which his company must perform in order that the community may be permitted to exist. He should know something about the intelligent effort, the technical planning necessary, and the financial study which must first be undertaken in order to produce the physical property, also the fact that the good will of the community must be obtained in order that fair treatment will be accorded which will permit sufficient earnings to be made in order to invite

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Making Mixed Gas in Horizontal Retorts

Old Horizontal Retorts Are Used to Manufacture Both Coal Gas and Water Gas Simultaneously—Ingenious Process Increases Gas Production in Small Swiss Plant

By J. Ruf, Translated from Bulletin Meusuel, 1923, 9-16.

The gas plant at Solothurn, Switzerland, is small, just a one-holder plant, but the gas men there are wide-awake, progressive and ready to experiment in new fields to accomplish results. The following article, written by the superintendent of the plant, will, we are certain, be of considerable interest to gas men in America, as an example of how a small outfit met a condition which confronts every gas works sooner or later. They had to make gas to meet increased consumption, and at the same time to conform with set standards as fixed by the city authorities.

They had just one holder and so they concluded to try making mixed gas and keep within the standards by manufacturing it in horizontal retorts. Coal gas was made at one end, water gas at the other, both leaving together and entering the common holder.

The results were eminently successful. A good gas was made. Fuel was conserved. By-products of value were recovered. The consumers were perfectly satisfied with a lower calorific power product which was used with greater effectiveness.

How it was done is described in what follows:

For many years past the yields of gas, coke and tar, obtained from the various coals, used in the gas plant, have remained practically constant. It would appear as if gas plants had reached a practical limit beyond which they could not go. As far as water gas production is concerned, the increased construction of water gas plants during the past years is to be laid to the necessity of meeting the increasing gas consumption by the extension of the existing gas-making equipment at low cost. The purpose of these water gas extensions was first to act as an auxiliary gas plant, which could be called upon for gas production as required by the demand for gas. The operation of the gas plant in this manner soon proved to be unsatisfactory, due to the change in the composition of the gas, brought about by the intermittent operation of the water gas sets, and to various other technical difficulties, connected therewith. The water gas sets were then operated as individual installations, the gas being collected in separate holders and mixed with coal gas in regular, determined proportions.

(The author discusses in detail the effect of the installation of water gas sets in large plants on the operation of smaller units in Switzerland and elsewhere. He points out that the existence of small and even moderate sized gas works was prejudiced by this development. He also discusses various other factors in gas works operation with the production of both coal and water gas, especially from the standpoint of coal scarcity and quality.—Translator.)

All these reasons in combination with the impossibility of carrying out new gas works construction led the author to search for a new gas manufacturing process, which could be introduced into the Solothurn plant of which the author is the general superintendent. The high price of coal, the great demand and low supply of the same, the various other increases in the cost of manufacturing gas, served to accelerate the efforts of the author to develop a new gas-making process, which could eliminate some of the disadvantageous features of the process in actual use at his plant.

Fundamental Principles in Water Gas Manufacture

Water gas is produced in the well-known manner by passing water vapor through incandescent coke. The production of water gas can be carried out in separate water gas generators or producers, which are made specially for this purpose, or else it can be manufactured in the retorts or chambers of the regular gas producing furnaces, which serve particularly for the production of water gas. The two processes differ from one another in the way in which the retorts or gas producing apparatus is heated. In the retorts or the chambers of the coal gas ovens, in which the contents of the retorts are heated indirectly, we have to do with an almost continuous evolution of gas, while in the case of the gas producer, due to the fact that the contents of the same are heated directly, the gasification period must alternate with the blast heating period.

Heat is consumed through the decomposition of the water vapor, as it passes through the bed of incandescent coke. This heat is supplanted by indirect heating with special firing in the coal gas ovens, while the water gas producer itself must be properly built so as to take care of this heat requirement or heat loss. This takes place by means of the so-called hot blast, which is turned on as soon as the temperature of the contents of the water gas producer is reduced below that required for the production of gas. The period of gasification begins after the heating of the contents of the producer has been concluded and lasts as a regular rule for about 4 to 6 minutes, while the hot blowing period is shortened as far as possible. The correct adjustment of the hot blowing period and the gasification period requires considerable care and can only be obtained by the aid of efficient operating labor. If the hot blowing period lasts too long, the additional heat that is added to the coke is lost in the gases that pass up the chimney. Accordingly the consumption of coke for heating purposes is unnecessarily high. On the other hand, if the gasification period is allowed to continue too long, then

an excess of steam is introduced into the generator and there results a double loss of heat, due in part to the cooling of the contents of the generator and to the excess of consumption of steam.

Water Gas Manufacture in Retorts or Chambers

The manufacture of water gas in chambers or retorts of the coal gas ovens may be carried out to good advantage everywhere where ovens, whether they are of the vertical, inclined or horizontal type, are available. The conditions must also be such as to allow an increased distillation period without entailing any too great cost, or the conditions must be such, as was the case in the writer's plant, where the productivity and the efficiency of the ovens can be increased by suitable changes in the construction of the same so as to render them available for the generation of water gas as well as coal gas. It is of course clear that the evolution of water gas begins and can only begin at that point when all the volatile products in the coal have been distilled off. This means that the coal has been strongly heated and consequently at that point, when ordinarily the retort would be emptied and filled up again with new coal. Under normal conditions a calculation must be made to determine whether the water gas can be manufactured at a lower cost in separate water gas installations than by increasing the size of the chamber ovens and manufacturing it in them, after the coal gas and other volatile products have been distilled from the coal.

In the particular gas works, directed by the author, there was no possibility of manufacturing the water gas in separate gas producers, for there was just one gas holder available. The carrying out of the process in this manner would have meant the erection of another gas holder. Furthermore, the installation of a process of continuous manufacture of water gas in conjunction with the regular coal gas operations appeared to be unfeasible from the standpoint of operating cost, because of the small production of gas. A calculation of the operating costs and details of the gasification process as described above, was found to promise no or only very slight advantages. The yield of gas from the coal was found to be so low, the production of steam necessitated so large a consumption of combustible that a cheapening in the cost of producing the gas could scarcely be expected.

Water Gas Making in Horizontal Retorts—Changes in Operation

The only practical and feasible way in which to produce the water gas, accordingly, appeared to be to manufacture it in the old horizontal retorts which were available in the gas works. There was some data available on such a method of gas-making, but this information, derived from German sources, did not lend any encouragement to the undertaking. In fact, if anything, it tended to point towards the failure of such a manufacturing process than towards its success. Water gas had been made in German gas works by this method, previous to the installation of the same in the Solothurn plant, but in the German plants the only object was to produce gas and large quantities of it. No attention was paid to the quality of the gas, to any limiting calorific power or specific gravity. The conditions were such that the consumer was glad to get any quality of gas, rather than no gas at all. So there was no similarity between the conditions there and as they existed in the Solothurn gas works. One thing appeared to be quite certain, and that was that a good financial return could be obtained from this process, provided the installation was built in the proper manner and the necessary amount of care was taken in the operation of the plant. The plant was accordingly enlarged so as to accommodate the water gas process, which was put into operation for the first time in July, 1921.

The retorts of an old horizontal oven were fixed up so that they extended through and through. Additional pieces were fastened to the rear part of the same and front-pieces were provided as well. Behind the oven there was erected a tending platform, covered with cast iron plates, from which the ovens were watched and tended to. The coke cake was pushed towards the back of the retorts by means of a pushing device, which was operated by hand. The steam used in the manufacture of water gas was made in a vertical fire tube boiler, which was heated by the flue gases from the coke ovens. Means were also provided for heating the boiler with coal by direct firing, but up to the time of writing this has not been found necessary. The flue gases can be passed in their entirety or in part into the boiler. Only one-half of them were required for this purpose, the other half being used in the chambers. The fire tube boiler was chosen for the reason that there is no throttling of the flue gases in it and the fire tubes can be cleaned out at any time with perfect ease. The boiler was operated with a pressure of only 0.1 to 0.3 atmospheres effective steam pressure. The feed water is drawn out of a tank, which is located above the coke ovens and which is indirectly heated by means of a steam coil by the waste heat from the former. The temperature of the feed water, entering the boiler, is about 60 degrees C. Heating up to that temperature results in the precipitation of the limestone and other partially dissolved salts in the water, so that there is scarcely any boiler scale formed in the boiler itself. The steam is further superheated by means of the waste flue gases from the coke oven before it enters the retorts to take part in the water gas process.

Details of the Operating Process

When the retort is completely filled and when the steam is introduced into it at its lower end, a practice which is followed out in several gas works to the knowledge of the writer, the formation of water gas must be effected in exactly the same manner as is described in the following. The difficulty lies in removing the coke cake from the retort. No retort stoker will fill the retorts so full

as is required in the manufacture of water gas, for he will then not be able to remove the coke from the retorts without very considerable operating difficulty. When the retort is only half full the results, however, are not up to standard.

In figure 1 there is seen the retort as it was originally constructed. In figure 2 there is seen the same retort with added end pieces so that the fuel and coke can be moved from one end of the retort to the other and out the same. The coke is removed by means of a hand-operated device. The operator is now interested in keeping the retort as full of fuel as possible, as under these conditions he has fewer retorts to fill. In spite of the fact that the retort is filled very full, the coke cake can be removed without any difficulty. This advantage is of importance when operating a straight coal gas installation as well as when operating to manufacture mixed gas.

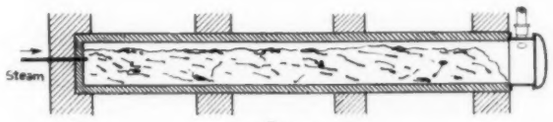
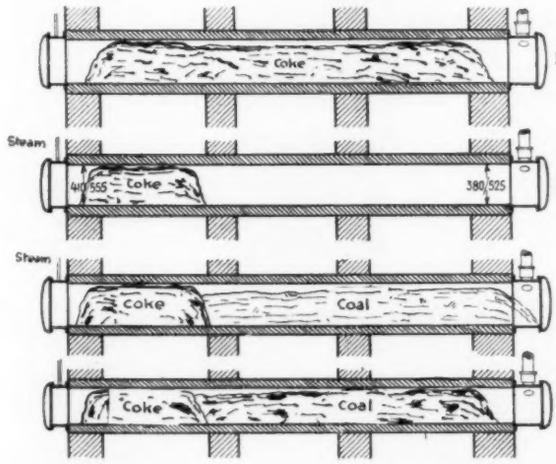


Fig. 1

The Old Retort in its original form.



In figure 3 there is seen the same retort, which is in this case made with a larger diameter at the back end than at the front end. The retort, made in this manner, has a greater fuel capacity than the one shown in figure 2. The retort is likewise filled as full as possible with fuel and after the same has been gasified, the coke cake is shoved back to the rear to such a point that about three-quarters of the coke falls out of the same and just one-quarter remains behind in the incandescent state in the rear part of the retort.

In figure 4 the retort is shown with its charge of incandescent coke in the rear and with fresh fuel filled into it until it is entirely full, right up to the cap of the same. The coal is then pushed together by the hand-operated device, so that the unheated anterior part, the head or cap of the retort and the front wall, remain free. If the retort is properly filled in the front part, then later on this part of the fuel is pushed back into the rear part of the retort and it is accordingly possible to obtain a retort which is entirely filled with fuel, as the compressed anterior part of the fuel is now in the rear of the retort. It is naturally important that the steam is forced to pass through the incandescent layer of coke, as otherwise the steam is not decomposed and passes out of the retort, mixed with the coal gas, in that condition. The production of water gas begins at once in the posterior layer of coke, while in the anterior part of the retort the production of gas takes place in the ordinary fashion.

Figure 5 represents the state of affairs after a period of two to three hours. After the gasification has lasted for such a period of time the coke cake in the rear part of the retort, particularly in the unheated portion of the same, cools off. But in the meantime the layer of coal, which lies in between the two ends of the retort, has been heated up to a certain temperature, so that the formation of water begins to take place therein. It is possible either to decrease or increase the length of time involved in this period of the gasification, according to whether it is desired to produce more or less water gas.

Then the operations of pushing out the coke, filling the retort with new coal, etc., are repeated over again in their regular order. When the process was first put into operation, the steam was shut off for a time, but today this is not done any more, and consequently this extra work is avoided, which was not always performed by the operators any way, and no disadvantages have arisen due thereto.

Results of the Change in Gas Manufacture

Right from the very beginning of the operation of this process, no difficulties whatever were encountered which disturbed or interrupted its workings. The consumers with but few exceptions did not remark or did not know that any change in the composition of the gas had taken place. Contrary to the expectations of the gas works officials, there was no increased consumption of gas due to the reduced heat value of the same. The introduction of the water gas process was not reflected in any abnormal increase of gas consumption, as was proven by an examination of the actual consumption figures for a period of two and one-half years.

It would appear as if an increased consumption of gas was a necessary conclusion of the introduction of the water gas process, as described above, but such was not the experience of the Solothurn works It is of course possible that in the industrial establishments, using gas, better combustion efficiency offset the reduced calorific power of the gas. As far as the use of gas in the household is concerned, it shows that it is always possible to effect improvements in the same. It was also found that certain adjustments in the burners of gas ranges were necessary at a few places; these burners were mostly of old types.

The gas works met the somewhat higher specific gravity of the mixed gas by raising the city gas pressure about ten millimeters. There was no very great additional load placed on the operating con-

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Meter Deposits and Meter Corrosion

Sulphur in Gas Destroys Iron—Iron Salts Render Leather Diaphragm Brittle and Act as Catalysts, Enhancing Gum Formation—Removal of Benzol and Toluol from Gas and Less Condensation in Mains Also Factors.

W. H. Fulweiler, Chem. Eng., U. G. I. Co., Phila, Pa.

The following discussion was delivered before the East Coast Conference, held in Philadelphia, April 18, 19, 20, 1923.

It is concerned with a subject that is of prime importance to all gas men and that has received considerable attention in the past. The fact that meter corrosion is due to the action of the sulphuretted hydrogen in the gas on the metal is well known, but it may not have been realized that the same impurity is also indirectly concerned with the destruction of the leather diaphragm and the formation of gum deposits. The iron salts formed destroy the leather and act as catalysts to promote the formation of gummy deposits. Other important factors, affecting the deposits of gummy substances, are discussed. Attention is called to the use of less oil and higher fixing temperatures to reduce formation of gum. Absence of benzol and toluol in gas which formerly kept gums in solution, and less condensation in plant, are potent in increasing proportion of unsaturated hydrocarbons in gas and thereby enhancing gum deposits in meters.

The question of meter deposits, corrosion and gumming is certainly a complicated one at the present time and must be divided into several headings. I believe that we can best consider the subject under three heads—

(1) Metallic corrosion.
(2) Diaphragm deterioration.
(3) Formation of gums.

Before going into a detailed discussion, I think it is necessary that we should have before us a picture of the chronological occurrence of these troubles, as I feel that this is important in explaining some of them.

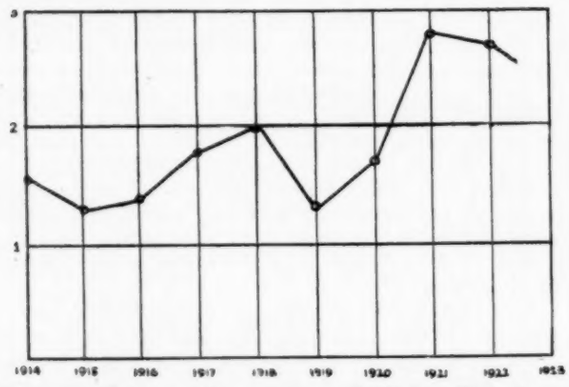


Plate 1—Relative Occurrence of Meter Deterioration by Years

While the chronology of the trouble is not the same in all plants, I think our plants are generally representative and the relative occurrence of meter deterioration is shown in Plate 1. This indicates a minimum in 1915, a maximum in 1918, a minimum again in 1919, and a high maximum in 1921. Since 1921 the curve is apparently sloping downwards quite rapidly. We will first discuss the question of metallic corrosion. By this I mean perforations in the case, eating off of the guide arms on valves and flag-arms, corrosion of the worm, etc. This corrosion is principally confined to the brass parts of the meter and to the tin steel of the case.

Plate 2 is a photograph of some valves where the guide had been completely corroded off and is a good example of this type of corrosion.

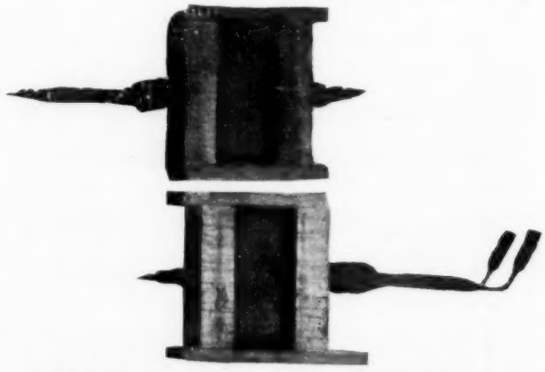


Plate 2—Example of Metallic Corrosion

I think our evidence is fairly plain to the effect that corrosion of this sort was due to sulphur compounds, very probably hydrogen sulphide; and I believe the reason for this was the very inferior quality of coal which we had to take several years back, due principally to what was known as "pooling" and to other causes over which our purchasing agents had no control.

Of course, added to the fact that we had bad sulphur in our coal, we had a serious labor shortage and the difficulties of securing adequate purifying materials; and in many cases I feel this resulted in more hydrogen sulphide going on the town than ever before in the history of the gas industry.

Our evidence indicates that this period is passed and that by and large the evidences of metallic corrosion are past history and not present history.

The next serious feature of meter deterioration was the disintegration of the leather diaphragms. You are all probably quite familiar with this. Plate 3 is a photograph of a diaphragm that has been completely destroyed at the bottom. It will be noted that the whole bottom portion of the diaphragm has disappeared.

The trouble may be anything from a small break in the leather up to complete disintegration. The diaphragm in the plate came from a dipping meter and it indicates that its disintegration was localized to those points where the tipping oil touched the diaphragm.

Plate 3—Sample of Diaphragm Deterioration

In this particular diaphragm the upper part is perfectly good; you can't tear it; it is perfectly tight; but the lower part is entirely disintegrated. That would appear to indicate that something had collected in the dipping oil and had acted on this leather.

We went into this at very considerable length; we taught ourselves how to cut leather thin enough to see through and made microphotographs of the leather, and I think we may generally summarize our investigation by saying that the leather was tanned with iron.

Our explanation is that sulphur compounds attacked the iron portions of the meter, forming iron salts, and that the iron salts tanned the leather; at the same time they were acidic in nature and to a certain extent they destroyed the original structure of the leather. The bulk of the meter diaphragms

Plate 4—Micro-photograph of New Leather

are in two pieces; there is an outside piece which is quite firm, and an inside piece which is very much less firm.

These two layers are held together by a set of connecting fibres. It was our universal experience in studying these disintegrated diaphragms to find that the two layers become separated; the connecting fibres which were rather weak were destroyed; and that, in addition, the interior structure of the leather was radically changed. There are a large number of little nodules, black nodules, looking through it by transmitted light, and we found when we treated these with appropriate reagents, they were composed principally of iron.

Plate 4 is a photo-micrograph of a piece of a new diaphragm and this shows quite plainly the structure of the leather made up of a large number of interlaced fibres.

Plate 5 is a photograph of a section of a piece of leather that has been seriously affected. In this, it will be noted that many of the interlacing fibres have disappeared and there has been formed in the leather, black nodules around which the fibres have been destroyed.

Plate 5—Micro-photograph of Deteriorated Leather

We believe that fundamentally this was caused by corrosive acids being formed from sulphur compounds; the acids attacked the case, forming iron salts, and the iron salts tanned the leather; and in general it is well known that iron tanned leather has a tendency to be brittle. All of this was proven by the character of the leather thus disintegrated.

One reason why we think sulphur was one of the important factors in causing this disintegration is the fact that we found rather large quantities of sulphur in the meter oil and in the leather. Our analyses indicated that where a meter oil, a dipping oil, contained originally 0.15 per cent of sulphur, after six years in some cases this had increased to 0.61 per cent—nearly four times as large. I think that is very indicative.

Secondly, when we analyzed the leather, the normal leather contained about .28 per cent of sulphur, and in some meters that had been in six years, that had increased to 7.25 per cent of sulphur.

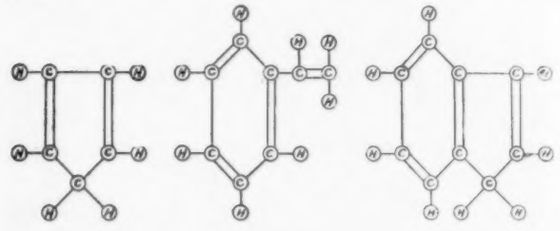
Again, the iron in an ordinary new leather is rather low, our figures showing about 0.23 per cent; and in some of these meters that had been in five, six and seven years, that figure had increased to 2.4 per cent.

It appears to us that the laboratory evidence is quite clear, that much of the disintegration of our diaphragms was due to the excess sulphur in the coals which we were compelled to use and that given a return to normal purifying conditions and normal labor so that we can maintain these purifying conditions, the metallic corrosion and diaphragm disintegration should be things of the past.

A third type of trouble that we have with our meters, and one which at the present moment is probably the most disconcerting, is the formation of what people call "gum."

Now, what is gum and where do you find it? As far as I can ascertain, you find gum everywhere, from the moment the gas is formed in the carburetter, out to the pilot tip. This gum has a variety of physical characteristics. It may be only a sticky oil; then it becomes like molasses; then it forms a soft resin of putty constituency; then it forms a hard resin.

We did a great deal of work on this subject and we were able to enlist the co-operation of the Bureau of Mines, who sent some very good chemists to us. As a result of this co-operative work, Dr. Brown of the Bureau of Mines published a report, and that is one of the things I was asked to comment on.



TYPES OF UNSATURATED HYDROCARBONS

Dr. Brown's work showed that these gums were probably due to the polymerization of unsaturated hydrocarbons and that this polymerization was expedited by the presence of increased quantities of oxygen in the gas, and that the formation of the unsaturated hydrocarbons was increased due to the fact that they were running higher oil rates per minute than had been the custom in the past.

I can briefly comment on some of these factors. In the first place, what is "polymerization"? It sounds like a long word, but it really isn't so bad; it means joining together. And an unsaturated hydrocarbon is simply a hydrocarbon that is dissatisfied with its state; it wants company.

You know, the chemist likes to draw structural formulas and he says, "Here is a carbon, and a carbon has four arms; it can tack on to four other things." This unsaturated hydrocarbon hasn't four different things to tack on to; it has to join on itself, and frequently we get combinations such as those shown in Plate 6. This plate gives the structural formula for three of the unsaturated hydrocarbons that we believe are present in these so-called gums that are found in meters. It will be noted that what are called double bonds exist in these formulas, and it is the presence of these double bonds that are characteristic of unsaturated hydrocarbons, and, furthermore, such hydrocarbons are very prone to combine with reagents and in fact many of them will combine with themselves, and it is this sort of combination that we call polymerization.

We have not actually isolated the first compound shown which is known as cyclo-penta-diene, but we have good reason to believe that it is present. The other two hydrocarbons, indene and styrene, occur in what is known as the solvent naphtha fraction in tar distillation, and it may be noted that their boiling points, 146 and 182, are so high that we might expect them to be removed in normal condensation. All of these hydrocarbons are characterized by the fact that on standing or more rapidly by heating and in the presence of a number of materials, the molecules gradually join together, forming larger aggregations, and as they do so they form sticky oils up to hard gums. Chemically, these materials are combinations of carbon, hydrogen, oxygen, sulphur and nitrogen, together with a certain amount of inorganic ash that seems to be principally composed of iron oxide.

Why do they bother us? Because these gums form all along our distribution system and they bother us most when they form on the valves of the meter. When they form hard sticky gums on the valves of the meter, the valves stop functioning; then you get a "won't-pass" gas or you get a "meter stuck."

The question of how we can control the formation of these gums is a very difficult one. Before I touch on that, I want to go one more step; when these things gather together and form these polymerized materials, what do they look like? Well, what they look like depends upon where you find them. If we have these things formed in the drips, they are characterized by a very high percentage of sulphur. I have analyses that show these contain as high as 19 per cent of sulphur. When they are formed on the governors, where the gas comes in contact with the air on one side, where the air is on one side of a governor diaphragm, then they seem to go for oxygen, and we have some analyses that show as high as 23 per cent of oxygen. The rest of it is carbon and sulphur.

What other characteristics are there to these gums? I haven't seen any sample yet that doesn't contain a certain amount of iron as an ash. These solutions can be filtered a great many times, and they still contain iron. So it looks as though iron acted, in a way, as an essential constituent in these gums, probably as a catalyst.

"Catalyst" is a term the chemist uses to explain why a reaction takes place when in the absence of a catalyst it would not occur or only very slowly. In general, it means something that expedites things; it causes the two things to get together and combine at lower temperatures, or more rapidly than would otherwise be the case.

These gums then appear to be catalyzed by iron, and there is so much iron that the gas is in contact with that. We can readily see why we should have it present.

To go on, then, this gum is probably formed from unsaturated hydrocarbons that are the result of cracking in our gas-making operations. Can we control it? Dr. Brown thought that he had detected a correlation between the more rapid input of oil and an increase in gums. But we have done our best, looking over our various plants, to try and correlate data of this sort together with the oxygen data.

With respect to the increase of oxygen in the gas, the evidence is decidedly fifty-fifty; some plants have slightly increased the amount of oxygen while other plants have decreased the amount of oxygen.

In connection with the rate of oil production, some plants have increased their oil rate due to the ability to get increased production from their sets, while other plants, owing to the fact that they changed from illuminating value standards to heat value standards, have decreased their oil rate. As a matter of fact, when we studied 20 representative plants, we found there had been a slight increase in oil rate. But all the evidence we can find indicates that when you reduce the oil per thousand you form smaller quantities of these unsaturated compounds, and when you increase the heat you form smaller quantities of these unsaturated hydrocarbons. It appears, therefore, that the two effects may counterbalance one another.

In general, we are now running on the average, higher fixing temperatures than we did five or six years ago. Generally, on the average, I think we are running lower oil per thousand than we did five or six years ago. So both of these effects apparently are working to reduce the formation of these gums.

There is one other thing that it seems to me is important, and that is the question of condensation. I have briefly shown that two of the hydrocarbons that we have definitely isolated, viz., styrene, that boils at 146 degrees C., which is 295 degrees F., and indene, boiling at 182 degrees C. or 360 degrees F., are both high temperature products and are vapors that you would expect with normal condensing facilities to be dropped in the plant or at least in the drips.

I feel that one reason that we have had more trouble in recent years than we had in the past is due to the fact that, taken by and large, the gas companies of the country have not been able to increase their condensing facilities commensurate with the increase in send-out. I don't mean to say there aren't single plants here and there that haven't been able to do it, but summarizing the thing up generally, we have not been able to do that. I feel, therefore, that we have thrown more and more work on our mains by making them act as final condensers. The consequence is that there is a tendency for these heavier boiling materials—which in the old days we condensed out and held back in our plants and in our street drips—to go forward in greater measure into the meter, where under existing conditions they polymerize and form these gums.

There is just one other point I wish to call attention to, and that is the fact that, in my opinion, we have always made gums; but in the old days when we were operating under illuminating value standards, we had a lot of condensible benzene and toluene along with them to dissolve them and keep them in solution, and keep them, therefore, just as an oily layer. Today, with our difference in standards, we are not sending out so much benzene and toluene in our gas; therefore, there isn't enough solvent deposited along with these gums to keep them in solution, and there is a greater tendency for them to form hard, sticky layers.

One thing that impressed us very greatly about this was the fact that through some curious coincidences there was a dispute about a meter. The meter was sealed and put in storage, and it just happened that about ten years later we discovered it. Ten years ago we weren't supposed to have had any trouble with gum. We opened up that meter, almost ten years later, and it was almost solid with gum. It merely showed that we were always making it, but in the old days there was sufficient light oils present to keep the gum in solution where it would not give any trouble.

We have endeavored strenuously to correlate plant operation with meter troubles, and the net result is as follows:

In the plants that had the lowest bad meters—that is, less than 2 per cent—they had a meter temperature of 82 degrees Fahrenheit, and we figured the average time of the gas in the holder was 6.4 hours. The plants that had the greatest trouble from meters—in the vicinity of 9 per cent—had a meter temperature of 92 degrees and the gas stayed in the holder 3.3 hours.

I might summarize the situation as it appears to us as follows:

Apparently, we have always formed these unsaturated hydrocarbons that were capable of polymerizing into gums.

Formerly, a considerable amount of condensable light oils such as benzol and toluol always went forward with the gas. These light oils act as solvents for the gum.

The gas appears today to receive somewhat less condensation in the plant, with a resulting tendency to higher meter temperature. Due to the increased output, the mains no longer have the same condensing capacity. In consequence of this, we are sending forward to our meters larger quantities of these unsaturated hydrocarbons that may form gums.

There is no conclusive evidence that we are forming more of these unsaturated hydrocarbons with our present operating conditions than we did in the past.

The sudden increase in meter corrosion, diaphragmatic deterioration and polymerization of gums in the meters that we noted immediately succeeding the war period was very probably due to the increased quantities of hydrogen sulphide that went forward under the abnormal conditions.

The sulphur compounds attacked the iron and the iron in the acids thus formed catalyzed the gum formation.

Table 7—Analyses of Gums from Different Sources

	PER CENT					
SOURCE.	Carbon	Hydrogen	Nitrogen	Sulphur	Oxygen	Ash
Street drip.	64.22	5.98	1.38	19.40	8.72	0.30
Main	58.11	5.41	2.98	21.20	11.22	2.08
Governor ..	53.72	4.73	1.48	0.60	23.21	16.26
Meter	75.42	6.68	0.44	1.76	12.11	3.59
Meter valve	26.02	3.60	Nil	9.36	9.62	50.25

Possible Gas Sales in the Domestic Heating Field*

By Wm. M. Carpenter, Engineer Empire State Association

The demand for hard coal by the householders of New York State bears a direct relation to the field open to the gas industry and to the demands which sooner or later must be made upon the gas companies. A careful study of this demand, its magnitude and distribution, will therefore be of the greatest importance to the manufacturers of illuminating gas in formulating their plans for the future.

Statistics of shipments from the mines show that communities readily accessible to the railroads and where no gas is available, use from one-third to one-half again as much hard coal as do similar localities where gas is provided. In the natural gas territory, in particular, the widespread distribution and comparatively low cost of this fuel have greatly reduced the per capita consumption of anthracite for household purposes.

The population of New York State may thus be divided into three broad groups: Those served by artificial gas, those served by natural gas, and those living where no gas of any sort is available. The normal shipments, and therefore the normal consumption, of the so-called "domestic sizes" (as distinguished from the smaller "steam sizes" used for steam-making purposes) of each of these three groups has been estimated as follows:

	Persons	Short Tons
(a) Served by artificial gas.	7,900,000	12,500,000
(b) Served by natural gas..	1,200,000	1,200,000
(c) No gas available.....	1,400,000	2,300,000
Totals	10,500,000	16,000,000

In the artificial gas territory, over 1,000,000 tons of the largest and smallest sizes are used by water-gas works and by such special industries as brickyards and fruit evaporators. This leaves for the householders some 11,500,000 tons, or 1.46 tons per capita. In the natural gas territory, which includes the city of Buffalo, the annual use of 1,200,000 tons of coal by 1,200,000 people represents a per capita consumption of only one ton and shows more than anything else the effect of cheap and widely available fuel. In the territories where no gas of any sort can be obtained, the per capita figure rises to 1.64. This value is, however, somewhat misleading, as the villages along the railroad lines will show a far higher use proportionately than will the "inland" of farming communities. The extensive employment of wood for fuel by the farmers appears to contribute largely towards bringing down the average per capita consumption of hard coal.

While but little detailed information is at hand as to the distribution of this tonnage into the various prepared sizes of coal, an approximation can be made by taking the proportionate production of the mines. Remembering that New York State receives somewhat more of its share of the largest, or "broken" or "grate" size than do other States, because of the number of large water-gas plants, we may fairly estimate the proportion and tonnage of anthracite received by the population of the artificial gas territory as follows:

		Short Tons
"Broken" size,	7% of 12,500,000.....	875,000
"Egg"	19%	2,375,000
"Stove"	28%	3,500,000
"Chestnut"	35%	4,375,000
"Pea"	11%	1,375,000
Total	100%	12,500,000

As far as the coal trade is concerned, the actual use of fuel by the domestic consumer by various months appears to be a closed book, and no studies of any sort seem to be available. The sum total of knowledge is that so-and-so much coal has been mined and so-and-so much has been shipped. If there is any further sort of information on this subject, the Fuel Administrations certainly never discovered it. The proportionate use of fuel for the various months has, however, not only been theoretically worked out by various authorities (see Mr. H. D. Valentine's paper before the Illinois Gas Association), but also has been very carefully determined by the gas companies for installations where gas has replaced coal, and by applying these proportions a very fair estimate may be made.

Of the prepared sizes, practically none of the "broken" size will reach the domestic consumer, and in addition some of the pea coal is used industrially. The consumption of the remainder may be divided into three classes, corresponding to the divisions established by the gas companies—that is, house heating by hot air furnaces, steam and hot water boilers; house heating by stoves and open grates; and cooking. Bearing in mind that the prepared sizes are made for specific uses, we may estimate the tonnage of these three classes as follows:

	Tons.
(a) For house heating by boilers and furnaces	4,800,000
(b) For heating by stoves and open grates	2,500,000
(c) For cooking ranges and stoves.....	4,200,000
Total domestic use.....	11,500,000

With these quanties to start with we can obtain an indication of the seasonal use of coal and what would be the normal load if all the anthracite now used in the gas-consuming portion of the State were to be replaced by gas:

*Paper read before the meeting of Gas Section, May, 1923.

Month	Furnaces, Boilers %	Furnaces, Boilers Tons	Grates, Stoves %	Grates, Stoves Tons	Cooking Ranges %	Cooking Ranges Tons	%	Total Coal Tons
January	21	1,000,000	18	450,000	10	420,000	16	1,870,000
February	19	915,000	18	450,000	10	420,000	16	1,785,000
March	13	625,000	13	325,000	10	420,000	12	1,370,000
April	8	380,000	7	175,000	10	420,000	8	975,000
May	3	140,000	4	100,000	9	380,000	5	620,000
June			3	75,000	7	290,000	3	365,000
July			2	50,000	6	250,000	3	300,000
August			2	50,000	5	210,000	2	260,000
September			3	75,000	6	250,000	3	325,000
October	6	290,000	5	125,000	8	340,000	7	755,000
November	12	580,000	8	200,000	9	380,000	10	1,160,000
December	18	870,000	17	425,000	10	420,000	15	1,715,000
Totals	100	4,800,000	100	2,500,000	100	4,200,000	100	11,500,000

If we assume a thermal efficiency of gas to be twice that of coal burned under similar circumstances, then the heating value of one short ton of 12,500 B. T. U. anthracite will be equaled by 22¾ thousand feet of 550 B. T. U. gas. Allowing 10% for the losses between output and actual use by the consumer, we can figure on 25 M. feet of gas sent out for each short ton of coal used by the householder. Under these conditions, the total send-out for this purpose will be shown by the following table:

Month	Total Coal Replaced Tons	Total Gas Made billion c. f.	Approx. Present Sendout
January	1,870,000	46½	8
February	1,785,000	44½	7½
March	1,370,000	34	7
April	975,000	24½	6½
May	620,000	15½	6
June	365,000	9	5
July	300,000	7½	4
August	260,000	6½	4
September	325,000	8	4½
October	755,000	19	5½
November	1,160,000	29	6½
December	1,715,000	43	7½
Totals	11,500,000	288	72

What a tremendous market is open to the gas industry in the cooking and heating field can be seen from these figures based upon the use of hard coal. With the possibility of supplanting by artificial gas and by coke the entire consumption of domestic anthracite, a potential business four times as large as the present gas industry still remains untouched in this State. This is shown on the accompanying chart, which gives each load, by months, superimposed upon the present sendout of the gas works.

Assuming that the present use of anthracite coal defines the prospective field of endeavor of the gas companies in the cooking and heating line, the questions still remain as to the most economical methods of meeting this demand. Two problems at once present themselves; the first, the technical one of finding out the best method of manufacture and distribution, so that the greatest number of heat units may be produced at the minimum expense; the second, the development of a rate structure which will be equitable; which will attract the business, and which will properly allocate the costs.

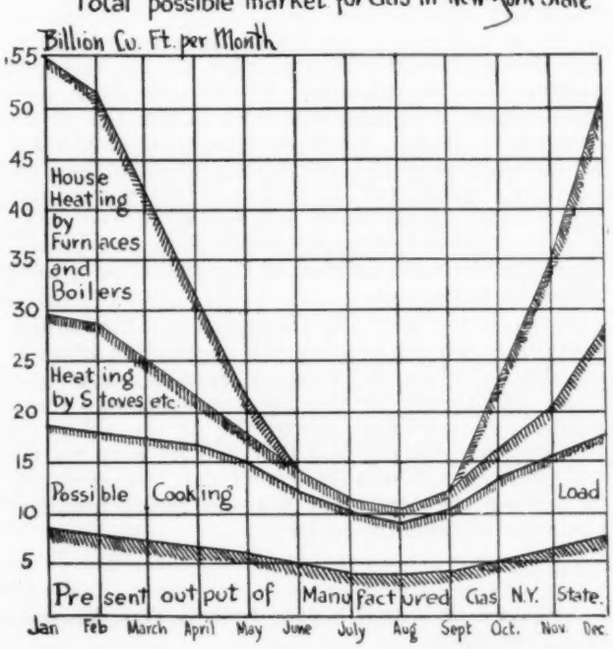
On account of the magnitude of the prospective business, it is possible to ignore the present gas plants entirely; where you are going to have a market four times the size of the one now being served, it is entirely feasible to disregard present conditions and to look at the matter from a different standpoint than merely that of the enlargement of the existing plants. This is the proper problem of the Gas Section, of this association; the other belongs to the Commercial Section.

To meet the demand for fuel in the field now occupied by anthracite coal, two methods are evidently possible:

(1) By the use of gas to replace all of the coal.

(2) By the use of gas to replace part of the coal, and by the sale of coke to replace the rest.

If straight water-gas is used, this annual sendout of 288 billion feet would require somewhere in the



neighborhood of 5 million short tons of anthracite. The nation would therefore save, by burning gas, some 6½ million tons of hard coal per year, which would greatly relieve the pressure on the mines. To offset this, however, some 850 million gallons of oil would be needed for the enrichment of the gas.

On a mixture of 25% coal (or by-product coke-oven) gas with 75% water gas, practically all of the coke resulting from the coal gas process would be needed for the manufacture of the water gas and none would be available for domestic sales. This would take about 7 million tons of gas coal, and the country would save 4½ million tons of coal per year, but use an additional 650 million gallons of oil.

On an equal mixture of coal and water gas, some coke would be left over for sale and this would decrease the prospective demand for gas until a balance would be reached. This would apparently be attained when some three million tons of coke would be available for sale, leaving the use of gas in the neighborhood of 200 billion feet. To accomplish this, about 9½ million tons of gas coal and 300 million gallons of gas oil would be needed.

Modern Plant Practice*

REFERENCE TO DEVELOPMENTS AND PRESENT DAY PRACTICE

By Edward Olsen, Superintendent Central Indiana Gas Co., Muncie, Ind.

It would be a difficult matter to prepare a paper so concrete that it would properly convey the full information that the title implies. I have therefore restricted this article to a few remarks in reference to a few developments and latter day practices (avoiding wherever possible, lengthy details), that I consider attractive to Indiana operators.

Any new developments that will increase the efficiency of the plant are attractive. Especially is this the fact if the developments may be applied to the existing units. Probably the greatest improvement to our ordinary retort bench is the Congden Scrubber Standpipe system. As most of you know, this system requires but one straight standpipe for each tier of retorts, the standpipe being sealed at the bottom, in a seal pot. Short nipples connect this standpipe to the sides of the mouth pieces. A valve at each retort is closed, before opening the mouth piece for charging and discharging. A stream of liquor is forced in at the top of the standpipe, flowing down through the standpipe to the seal pot, thence through the drain to the separating well, from where it is again pumped to the top of the standpipe. If the retorts are properly patched and all air leaks properly sealed, stopped standpipes are positively eliminated. The bench fronts present a much better appearance and are more accessible. Considerable weight on the mouth pieces is removed, insuring a better condition of the wall tiles or neck pieces of the retorts.

As there are only two standpipes and two bridge pipes, the task of keeping the upper deck clean is simplified. While the Congden Scrubber Standpipe is not strictly a new development, some two thousand standpipes being in use, the proven ability of this system, plus the fact that it is an easy matter to install on any existing retort unit, warrants me in making the statement that no retort house is complete without this system.

*Paper presented before Indiana Gas Association Convention.

Liquid Purification

The development of the Liquid Purification process appeals to all gas plant operators. The Seaboard process, which was recently perfected to remove all traces of H_2S and Cyanogen Compounds, presents something new, both as to method of operation and materials used. Quoting from the paper of F. W. Speer, Jr., which was presented at the meeting of the A. G. A. in 1921, the process is briefly as follows:

The raw gas after the removal of tar and ammonia passes into a scrubber called an absorber. A sodium carbonate solution is pumped from a supply tank through the absorber and flows out into a separate receiving tank. The fouled solution from receiving tank is pumped over a second scrubber which is open at the top and connected to a fan at the bottom. Air is forced through this scrubber and the solution flowing down is thereby revivified and returned to supply tank from which it is continuously pumped over the absorber.

The process is without doubt very simple, and presents many advantages over the old method. The flexibility of this process enables us to utilize qualities of coal heretofore considered unfit for gas-making purposes. Excluding the Seaboard plant, the plant at Battle Creek, Mich., is the only other plant using this process. The results obtained from the operation of this plant were fully covered by Mr. Seymour, vice-president and general manager, before the Michigan State Gas Association in 1922.

In answer to the following inquiries:

1. Is it possible or practical to carry this process to a point that will eliminate H_2S and cyanogen compounds to the extent that purifying boxes need not be used, or do you recommend a catch box for removing traces?
2. Are you in position to state the approximate cost per thousand cubic feet of gas purified?
3. What would you consider as the minimum size plant where this operation would be an economical and attractive proposition?

(Continued on Page 456)

As the Journal Views It

LEGISLATING NATURE

Nature's laws are inviolable! They defy man's efforts to set them aside. Even the edicts of legislatures cannot change them. The futile attempts to evolve legislation, impossible of fulfillment, impractical of accomplishment from every standpoint, even at variance with long-established precedence and the legal opinions of high courts, to take their place can only result in harm. No purpose is served by filling the statute books with laws, which must necessarily and will unquestionably be declared unconstitutional and confiscatory.

Of this character is the dollar gas law, recently passed by the New York State Legislature and now awaiting the signature of the Governor. It is hard to see how intelligent men, in view of the decision of the United States Supreme Court last August, can knowingly devise and pass laws which in their inner consciousness they must know or should know will not stand legal scrutiny any more than a sieve will hold water.

Is it again a case of fooling the public, of offering a candy-coated, alleged panacea of all evils, relating to gas, in the form of a high-sounding legal edict, making it obligatory upon the New York gas companies to supply gas at a set standard of heating value at a price fixed without any intelligent consideration of the costs involved in its manufacture and distribution?

Will the public fall for the farce? The gas companies will have to fight the law once more and prove that even the command of the legislature cannot now make it possible for them to manufacture dollar gas at the legal standard, and allow them at the same time to meet their current obligations, without mentioning the payment of dividends to the stockholders. Educational propaganda to teach the gas-consuming public what gas is, how it is made, how it can be used in the household as well as in the factory, not only for the uses prevalent today, but for the many other neglected purposes for which it can advantageously be employed, is absolutely necessary, for in no other way can the real story of gas and its unique service to mankind be told.

Once the consumer knows what he owes to gas, to the night and day vigilance and labor of men and women so that at any moment while the sun is shining or after it has sunk in the West, in the heat of the summer and in the bitter cold of the winter, when at times his pillar of support, coal, has failed him, when under any and all conditions he may turn the cock on the gas stove or gas heater and get heat, then such foolish, troublesome laws as the dollar gas bill will no longer be tolerated.

It would be well if the whole truth were told. It would be well both for the gas companies and the public. This should be the goal toward which the gas industry should be moving, the popularization of gas, the extension of its use to all fields of human endeavor both in the house and in the factory, as the universal fuel.

GAS COURSES AT VARIOUS COLLEGES

It is gratifying to note the interest that has been aroused in various educational institutions throughout the country in the matter of our public utilities, and especially so the gas utility.

A year ago, an industrial gas class was inaugurated at the Massachusetts Institute of Technology. This proved to be a splendid success, and the plans for this year have been considerably enlarged, the details of which will be found on another page in this issue of the American Gas Journal.

At the meeting of the Illinois Gas Association in March, the Gas Section was addressed by Charles M. Thompson, Dean of the College of Commerce and Administration of the University of Illinois. He outlined the plans being formulated to include in the curriculum a course which might be termed "Fundamental Economics of Public Utilities," including administration, finance, engineering and management.

Ralph E. Heilman, Dean, School of Commerce, Northwestern University, also addressed this meeting, and stated that they had a program for the education in utilities, and expressed his conviction that such courses should be established in all local educational institutions, all with the same course of study, not only for day students but for the men already engaged in various kinds of utility work. He stated that these courses in his opinion would tend to professionalize the whole utilities industries, lessening criticism, promote good management, and

encourage research in the various problems of the utilities.

It has just been announced that the Johns Hopkins University of Baltimore, Md., will open a course in Gas Engineering, beginning the coming fall. The credit for this is entirely due to the Southern Gas Association, which guaranteed a donation of $6,000 per year for a period of five years, by subscriptions obtained from the public utilities of sixteen Southern states.

L. Irving Pollitt, the chairman of the Southern Gas Association Committee, having this matter in charge, is to be congratulated on bringing it to so successful a conclusion.

The 1923-1924 Catalog of the Johns Hopkins University contains a complete outline of the studies, in which is offered a four years undergraduate course, three years of which deal largely with mechanical engineering and chemistry, and the fourth with special training in gas manufacture, distribution and utilization. This course will include laboratory work and inspection trips to various plants. The Consolidated Gas, Electric Light and Power Company of Baltimore has been very active in furthering these plans, and offers various facilities to carry on the work.

All of this shows the interest that has been aroused during the last two or three years in the importance of the gas industry to the country. In order to make these courses a complete success, they must have the co-operation of gas company executives. The young men who take these courses do so because of their interest in the subject, and after they have completed the course, it is the duty of gas companies throughout the country to take some of these students into their organization, so that they may have a term of one or two years in practical work. This will give each one a chance to find out what special branch of utility work he is best fitted for, and the executives of the company can then place them in the positions they have shown a special aptitude to fill.

In a recent talk, Martin J. Insul, Chicago, stated that in his opinion the most important problems confronting the public utilities today were finance and administration. He stated also that there were over sixteen billions of dollars invested in the utilities in the United States today, and that about one billion dollars in new securities were put out each year, that the executives were the trustees for the money of thousands of investors, and that the business should be administered by trained minds.

Now that some of the leading educational institutions of the country have taken this matter up in the manner stated above, they should have the active co-operation of the gas industry, with the idea that new courses will be inaugurated from time to time in other educational institutions throughout the United States, all of which is bound to be of great value to the American gas industry.

PUBLIC RELATIONS OF PUBLIC UTILITIES

(Continued from Page 442)

capital into the undertaking, and thereby make it possible to obtain proper and adequate physical facilities to furnish the necessary, and continuous, service for a progressive growing municipality. Team work by the management and the employees will go far to produce a successful utility, but that of itself will not accomplish all of the desired results.

How the Investment Company Can Help the Public Utility

A lone utility by itself cannot employ the best utility experts in all lines of its endeavor at a normal or proper cost. The service of public utility specialists is sometimes furnished by investment companies in the following manner:

An investment house, which assists many utilities in increasing the use of the dollar invested and in producing more dollars with which to furnish facilities to meet the ever-increasing demands and increasing growth of the community, may be employed. The results accomplished for the price paid are frequently phenomenal. The reason is that, due to a large clientage there will be a diversity of the time of demand for the services of the various experts by the utilities and thereby make it possible to employ highly educated and widely experienced technical specialists who are continuously employed by many properties, thereby minimizing the expense to each individual utility. The specialists in the respective lines of utility work, financing, engineering, accounting, rates, merchandising, purchasing, selling, etc., are also much more fully equipped due to environments in which they live and the many diversified and highly specialized problems which they meet and solve. The investment company is usually very familiar with public relations and public policies, because it is part of the study in connection with the disposal of the utilities securities, and it can therefore materially assist when requested in educating and moulding favorable public opinion.

The misunderstanding of the public, the unfamiliarity with the functions of a utility and the prejudices which have been engendered must be overcome. The attacks of the radical, the use of the utility as a stepping stone to further the selfish interest of the unscrupulous, and the unjust demands of misinformed customers must be met. Proper presentation of the facts of a public utility in a popular and attractive way is the only means of inspiring confidence in the utility and of promoting good will.

The question naturally arises by what means should the facts and information concerning public utility undertakings be imparted to the public.

I believe the proper answer to the question is a national one. I think that the problems should be handled generally in the following order, which, when effectively undertaken, should lead to the proper co-ordination of all of the effects and a co-operation which will permit each to draw from,

and assist, each other to even a greater extent than that which is now being accomplished.

Various Means Are Available for Educating Public

First: The utility employees should become familiar with the employers' problems to the extent that they can discuss the general problems intelligently and effectively and will take pleasure in showing their familiarity with the business in which they are interested and employed.

Second: The people in the community in which the specific utility is located should be made familiar with the duties of the utility, its importance and its necessity, and with the fact that the treatment which is accorded a utility by the public is an important factor in influencing the service which is rendered or to be rendered.

Third: The work of educating generally the people in the state must of necessity be general in its character and should be conducted under the supervision of the companies through committees and then through the State Bureau of Public Information.

Fourth: The national work of education which must be performed should be undertaken by the national associations assisted by the state bureaus of public information.

In order that an employee may have sufficient incentive to become interested in the public utility affairs, I believe it is most essential that each official, no matter what office he may hold, should be a student of the company's problems, and that he should take time to educate the employee, so that he will realize that his advancement will depend to some degree on his public relations. I feel that the importance of this cannot be too strongly emphasized. There are many methods and ways to educate employees, consequently the officials of the utility should closely follow the results of the method tried.

One of the first important public relation problems to be given consideration is to be sure that employees who cannot by training or otherwise make friends with the customers and the public are not assigned to positions that require contact with the public. Each employee must be taught that he not only represents the company, but is to a number of people the company and he should, therefore, inform himself about utility affairs and be positive that no misrepresentation is made, and then do his utmost to conduct himself with proper decorum.

The people in the community can be made more familiar with the functions of a utility and its importance in the community by means of the local press, through school and other debating societies, when some of the problems of a public utility can be advantageously used as the subject, by talks before the various civic organizations, clubs, societies, etc., at any time when there is an opportunity to present some subject relating to a public utility in an interested or novel way by visualizing some act or picture depicting something interesting and of some moment concerning a public utility.

Public Ownership of Utility Stock Favored

Probably the best method to permanently inform the public is to have them own the utility through personal interest in its investment stock, because investors in the stock generally will endeavor to inform themselves of the problems and prospects of the company.

It will require the co-operation of the employees, the local public, the state information bureau, the national associations, to familiarize the general public with a utility's problems and difficulties. The work must, and should, go ahead without any interruption.

The state bureau, as usually organized, and when properly functioning, is a most necessary attribute in the dissemination of information which will ultimately demonstrate to the public the important position of a utility in the picture of human activity, health and comfort. I will merely mention how some of the bureaus are organized.

When it is considered that public utility service is rendered in almost every community in a state and frequently by the same utility or through the interconnection of several it is at once apparent that the public utility information should not be local, but that all communities should be reached. Every utility in the state should be a part of the bureau and each should have an equal voice, whether large or small.

One way to accomplish the above is to have a large public information bureau committee representing every locality in the state and a proper representation of each kind of utility. The large committee should consist of the main executives of the utilities (too frequently the executives delegate this most important duty to some individual in subordinate authority. Where this is necessary to be done the executive should relieve himself of other work and should concentrate more upon the important work of public relations.) From the large committee there should be appointed a few of the well-known leaders in the industry in the state, to act as members of an executive committee and to steer the activities of the bureau in connection with the director, who with his assistants give their undivided time to the work. The committee should meet with the director at least once a week and advise and suggest as experience will dictate. A meeting of the large committee should be held occasionally. The members of the large committee should follow very closely the work of the bureau, and should offer every advice and suggestion. The director and his assistants must prepare the information relative to all classes of utilities. It is his business to demonstrate fairly, fully and impartially through the medium of newspapers, bulletins, pamphlets, booklets, speakers' bureaus, motion pictures, etc., what a public utility is, what are its functions, what are its problems and its relations to the community. It is necessary to point out the general principles and the economies of the business and the present methods of regulation. The above information will answer any question relative to the utility being a monopoly, suggested dishonest capitalization, extortion, selfishness and unscrupulousness. The public information bureau must present facts, sound opinions and sound theories, sustain truths and thereby greatly discourage and discount unfair statements, prejudiced opinions and the activities of the demagogue and the socialist.

MODERN PLANT PRACTICE

(Continued from Page 452)

Mr. Seymour writes as follows:

"The Koppers Company has in operation at the Seaboard Plant, the Liquid Purification principle, completely purifying gas with it. This is accomplished by a supplementary piece of apparatus, consisting of an oxide box, through which is sprayed completely actified soda solution, the process being intermittent with respects to the circulation of the soda solution. H_2S is completely eliminated and I understand that approximately 85% of the cyanogen compounds are removed.

"For any plant having oxide boxes and installing a liquid purifier, I personally would not recommend complete purification by the liquid process as the cost of removing the additional 10 or 15% is higher than with the catch boxes, and I believe it advisable to have the catch boxes on the line for assurance. For these reasons we have not attempted to completely purify with the liquid plant at Battle Creek. I believe, even with the installation of a new plant which had no purifiers, I would make it a combination of the liquid purifier and the oxide catch box.

"The cost of purification with the oxide boxes averaged 1.3c per thousand cubic feet, during the two calendar years preceding the installation of this apparatus. It has averaged, since the installment of this apparatus, approximately 0.5c per thousand cubic feet, and this is the combined liquid purifier and oxide box operation. I believe this is a fair figure to use as typical of the cost of operation, varying, of course, somewhat with local conditions.

"I am very enthusiastic about the Koppers Liquid Purification process, and I believe it can be applied to any sized plant down to the smallest. In fact, I recently seriously considered the installation of it at Marshall, where our output is less than fifty thousand cubic feet per day. If it were not for the fact that an all-around laborer at the plant changes the boxes, but eliminating that portion of his time used in changing the boxes and mixing the oxide would still leave him on the pay roll, we could figure to save money on as small a plant as that."

Most of us have had the disagreeable experience of receiving coal of excessive sulphur contents, the gases of which foul the oxide boxes in a fortnight. Also we have all had our troubles with the cyanogen compounds. The cardinal features in favor of the Seaboard method, even though operated with the catch box method, are extreme flexibility, the removal of the cyanogen compounds and reducing to a minimum the irksome task of refilling the oxide boxes.

Numerous and very interesting articles have appeared in our various trade journals in recent years, in reference to the use of coal as a generator fuel, for water gas operators. These papers have dealt primarily with the carbonizing results obtained. Taking an average of these reports, results are as follows: With good practice, utilizing both low blow and purge run, a yield of one thousand cubic feet per 48 pounds of coal can be obtained. The capacity of gas-making apparatus in this operation is reduced from 10 to 30%. The cycle of operation follows closely the usual method employed when using coke, the quality of the coal determining the arrangement of the cycle. It is not the purpose of this article to criticise the practice in general. There are, however, a few pertinent reasons for warning against the general practice advocated. If you will not, wherever carbonizing yields have in any way approached satisfactory results, the use of the blow and purge runs have been advocated.

The residual tar made during these runs consists of wild pitch and coal tar emulsion. The tar made in the carburetor is an oil tar emulsion. The mixture of these two different hydrocarbons produces a very undesirable product. The average water gas set is constructed to generate the blue gas from hard coal or coke containing very few impurities, consequently requiring a very limited amount of scrubbing as compared to coal gas. The result is that the tar fog cannot be entirely removed with existing scrubbing and condensing facilities, thus permeating the entire plant, destroying purifying elements and, what is still worse, entering the distributing system.

There are very few coals having any merit in this method of operation. Results achieved so far do not warrant supplementing coal for coke fuel excepting in isolated instances. However, if coal is to be considered as generator fuel, it would be advisable to consider additional scrubbing and condensing apparatus to supplement existing units.

Some years ago several gas companies attempted to heat benches and ovens with outside producers.

For devious reasons these attempts were not successful and in some cases producers were abandoned. It is apparent from recent articles written by members of the various gas associations that whatever the difficulty was, has been overcome, and we now find that several companies are operating producers for this purpose, with very favorable results. The hardest wear and tear on benches and generator fired ovens is usually in the generator. Improper sealing of generator lids, excessive clinkering, etc., are the causes of considerable damage to benches proper. Considerable labor is involved in clinkering generators. As reports indicate producers are now so constructed and operated that no clinkering is necessary. Considerable hard labor is eliminated and, what is more attractive, an economical method of disposing of our braize production is provided.

Automatic Control

There has been several new developments of the automatic control of Water Gas Operation, making this apparatus a very desirable adjunct to the plant. Through the medium of this apparatus, a given cycle of operation can be maintained indefinitely, thereby eliminating human error and fatigue and insuring increased efficiency.

The automatic control is, of course, most attractive where a number of units are involved, making it possible for one operator to control entire production, insuring uniform runs and results.

Most of our plant efforts are directed towards obtaining a perfect thermal balance. We have witnessed many new methods of carbonization, all having some merit. Upon analyzing reports emanating from various installations, unusual results obtained are readily traced to heat conservation and waste heat recovery.

The double pass boiler permitting of heat recovery from blast and make runs, and the ordinary waste heat boiler are the prime factors in waste heat recovery.

While results obtained vary all the way from ¾ horse-power per ton of coal carbonized in a coal gas plant to 70% of required steam in water gas operation, these results indicate that we must eventually apply this principle of heat recovery in general. It is now common practice to utilize exhaust steam for preheating feed water to boilers. The average plant produces far more exhaust steam than is required for this purpose, and allow this steam to go to waste. Under slight pressure and minor alterations in a plant this steam is available for ammonia stills, generator fires, plant heating and other useful duties representing a considerable recovery of waste heat.

Fluctuating Pressure and Public Opinion.

Fluctuating pressure and quality are instrumental in molding unfavorable public opinion. The gas companies in general have made ample provision for protecting pressure conditions by installing compressors, laying trunk and main lines to convey gas to the weaker points, etc. We have placed recording gauges on our steam plants, com-

Periodical tests are taken on a Junkers calorimeter to check up on this instrument, and we find very few corrections are necessary.

This recording calorimeter eliminates the necessity of supplying a man both day and night for the purpose of taking B. T. U. tests, supplies the operator with the information desired at any moment, and is instrumental in developing more efficient operating results, as each shift will make especial effort to turn out an even chart.

At the end of the day the manager or superintendent has a B. T. U. record for every minute of the day. This record has been turned out mechanically and is absolutely free from human error or dishonest manipulation and is without doubt the most valuable record obtained from the plant, as it is positive proof of quality of gas delivered, and a very good indicator of plant performances.

In this article I have attempted to stay strictly within the bounds of calling attention to apparatus of unquestionable merit, easily installed in conjunction with existing units, thereby reducing labor and material cost and increasing efficiency of these units. pressor plants, regulators, to insure the proper application of these installations. We depend upon these records because they are mechanically produced free from human error and dishonesty.

To insure the same condition relative to the quality of the gas, the Central Indiana Gas Company installed a recording calorimeter in its Marion plant. The calorimeter proper can be installed in any part of the plant, preferably close to the gas supply to be tested. The recording instrument can likewise be located conveniently, irrespective of location of calorimeter. The heating value of the test gas is determined by imparting all of the heat obtained from combustion of test gas to a stream of cooling air, and measuring the rise in temperature of the cool air. The gas and cooling air are maintained in fixed proportion to each other by metering devices geared together. Consequently, the temperature rise is directly proportional to the heating value of the gas.

The calorimeter is operated by current from any commercial circuit.

With a mixture of 75% coal with 25% water gas, some 5 million tons of coke would be left over for sale to the domestic consumers, and the gas demand would drop to 150 million feet. If 100% coal gas were used, the coke available for sale will be about 6,000,000 tons and the potential demand for gas will drop to a little over 100 billion feet. This cutting down of the prospective demand for gas by selling gas-works coke presents a very interesting study. It brings up a phase of the gas industry's future which must be very seriously considered, as there undoubtedly must always be a balance between coke, anthracite and gas in the heating field.

Above all, we must remember that the heating demand is already here to stay and that the business is ready and waiting for the gas companies to go after it. The ease and reliability of heating by gas, the doing away with dust, ashes and the furnace man, the saving in space and in the time of the housekeeper, are advantages which go far towards offsetting a present slight disparity of costs. It must also be remembered that the day of cheap hard coal is gone forever; that the greater the inroads made upon the smaller, or "steam" sizes, by gas and oil and electricity, the higher will have to be the price of the remaining so-called "domestic sizes." It is inevitable that further strikes will take place in the anthracite industry and that the domestic consumer will first be frightened and then mulcted by periodical "coal shortages" from which by the use of gas he would be entirely free.

In conclusion, we must regard the whole problem as being still in its infancy, but, unless we wish to take seriously Mr. Roger Babson's extravagant remark of last fall, that the gas industry "is dying and has probably seen its best days," the entire field of industrial and domestic heating must be given very careful consideration.

MAKING MIXED GAS IN HORIZONTAL RETORTS

(Continued from Page 445)

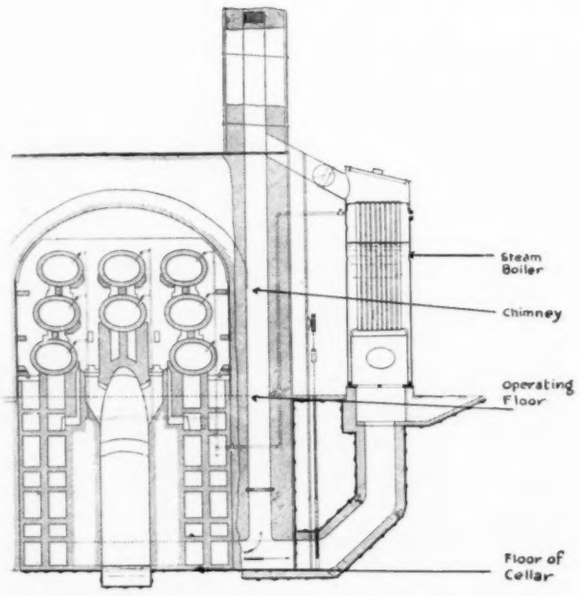
trol through the introduction of the new process, but it must be said that it was possible to obtain gas within the legal limiting specifications without causing any disturbances in the supply of gas only by exerting the greatest possible care in carrying out the operations. A liberal use of gas analytical data, collected at frequent intervals and obtained with the Otto gas tester, which was used for analyzing illuminating gas as well as producer gas, was an essential feature of the operating control. By glancing at this instrument it was possible to tell at any time whether the mixed gas, being produced, was within the set specifications. The operator was able to tell by the height of the inner cone of the flame of burning gas whether the gas was being sent to the holder in the proper mixture or whether still more water gas must be added thereto or whether the steam must be shut off from one retort or more. When the operations were controlled in this manner, there were never any complaints that the gas flared back in the burners. The heating value of the gas could be estimated almost exactly from the appearance of the flame of burning gas.

It was found that gas ranges and cooking apparatus in general are much less sensitive to additions of water gas to the gas mixture in somewhat more than the permissible or rather most effective proportions than to the sucking in of flue gases into the gaseous production due to retorts which are not tight and to a strong suction in the hydraulic mains. The presence of these inert gases in the illuminating gas always results in disturbances of greater or lesser severity. For this reason gas works which possess just a single gas holder must operate their plants with greater care than when two or more gas holders are available for receiving the produced gas. The latter class of gas plants can produce water gas separately in periods when the plant itself is not operating to full capacity, as on Sundays and holidays. When the gas works has but one holder, the operation of the gas manufacturing plant must be simultaneously as far as the production of coal gas and water gas are concerned, in order to avoid any disturbances in the operation.

The load on the retort furnaces is considerably reduced by the manufacture of combined water and coal gas in the place of coal gas alone. The capacity of the retort ovens is increased to a large degree. In the former case, when manufacturing coal gas only, three ovens with twenty retorts were fired in order to make sufficient gas to supply the demands; after the introduction of the new process, only two ovens with sixteen retorts were required to fill the gas demands, and at that without pushing the apparatus in any way. In place of charging the retorts from 72 to 75 times, when coal gas was manufactured, only from 50 to 60 charges per day were required in accordance with the quality of the coal used. This naturally resulted in a lowering of the labor cost, as well as in a considerable saving in combustible burnt under the gas generating furnaces, as in this case only two of these furnaces had to be heated in the place of three as formerly.

Production of Coke

There is of course no doubt that a certain amount of coke is used up in the production of water gas, but this is only very small, and its exact proportion cannot be determined without exact tests. It did not come up for consideration in the operating data and costs, which were worked out in the Solothurn plant. It was found that in the first half year's operation of the gas works without the water gas installation there were consumed 1,732.6 tons of coal with a production of 558,100 cubic meters of gas and 837,210 kilograms of coke. In the second half year operation with the water gas installation the coal consumption was 1,579.2 tons—153.4 tons less than above—with a production of 611,830 cubic meters of gas—an increase of 53,730 cubic meters—and a recovery of 53,838 kilograms less of coke, or a total of 783,172 kilograms. The yield of coke per ton of coal was 48.3 per cent in the first half year and in the second half year, when water gas was produced, in spite of the lower production of saleable coke, the yield was 49.6 per cent, because of the lower consumption of coal. These operating figures show clearly that the new method of operating the gas works was successful right from the start. There is no question at all as to the economic feasibility of the process.



Arrangement of Retort Furnace

Production and Character of the Gas

It is almost possible to obtain any yield of gas by prolonging the duration of the distillation. German gas works, operating on this method, have obtained yields of 48 to 50 per cent. The operations were carried out in such a manner in the Solothurn plant that an illuminating gas was manufactured which had a heating value of 4,600 calories. This corresponded to a yield of 38 to 42 cubic meters per 100 kilograms of coal, according to the character of the same. The gas contained 70 to 75 per cent of

coal gas and 20 to 25 per cent of water gas. When the best grade of American gas coal was used the gas output increased from 32.2 cubic meters per kilogram of coal, when just coal gas alone was manufactured, to 38.7 cubic meters per kilogram when a mixture of both water and coal gas was manufactured.

The coke that is finally recovered from the gasification process is composed of coarser lumps and lighter in color due to the fact that it is allowed to remain in the retort for a long time, gradually cooling off. The tar that is obtained in this process is somewhat more thinly liquid than the tar recovered in the original process, but it is still suitable for tarring roads. The deposit of gas carbon on the walls of the retorts is only slight, due to the fact that the carbon is decomposed and converted into water gas during the gasification process. No trouble is experienced any longer from the stopping up of standpipes due to thick tarry deposits. Naphthalene deposits are no longer formed in the distribution system, although the naphthalene washer is irrigated with clear water only. There does not appear that there is any undue wear and tear on the retorts due to the new process. The maintenance of a high temperature in the retort furnace is a factor in the operation.

INDUSTRIAL GAS SALESMEN'S COURSE AT MASSACHUSETTS INSTITUTE OF TECHNOLOGY

At the meeting of the Gas Sales Association in New England Mr. John J. Quinn, secretary of the Industrial Gas Class, was called upon by Governor Woodhead to give a little information regarding the industrial class for gas salesmen, which will be held at the Institute of Technology in June, 1923.

Two courses will be given to run simultaneously—June 18 to June 30.

One course to be designated first year—the other second year.

First year course intended to give a more general outline of industrial gas application, following closely the line of last year's class with such revision as now seems desirable. For this course there will be lectures every morning and laboratory work each afternoon.

All those enrolling for the first time will be expected to take this course unless their practical or technical training in the past would qualify them for membership in the second year class.

Second year course will consist in major part of laboratory work, including the testing of various apparatus, the solution of problems and much actual work such as heat treating of metals, melting of metals and the like.

No visitations to industrial plants will be on the program. The inspection of a nearby gas works will be included, however.

The two courses are now being prepared. An outline will be published and distributed throughout the industry within a few days.

Prof. Wilkes and his assistant, O. K. Bates, will have charge of the work.

The exceptional lecture by V. M. Hillman on "Heat Treatment of Metals" will be repeated for both first and second year classes. This subject will be given major attention.

Actual heat treating and complete explanation of what goes on in the various processes will be given.

Actual work to be done on Gas Steam Boilers, Heater Treatment of Metals, Melting of Metals, Ovens and Air Circulation, Water Heating.

Two lectures of an inspiration character will be given by nationally known men.

In so far as possible the lecturers will be be recognized authorities on the various subjects.

Aims of Committee

1. To provide a practical and immediate source of training in the industrial application of gas.
2. To impress Technology with importance of Gas Industry.
3. To secure from Technology their support in the establishing of a permanent course in industrial gas application and by so doing assure the development of the gas industry along practical scientific lines.
4. To establish a permanent gas laboratory where problems in appliance construction and proper application of our product can be worked out.

What Has One Year's Effort Produced?

1. The establishment of a basis upon which a permanent course can become a reality.
2. Noticeably increased interest by Technology in the use of gas as a satisfactory source of heat. Various experiments along these lines have already been done through the college year. A temperature of over 3,300 degrees F. was obtained by Prof. Wilkes by the application of well known industrial gas burner. The expression of absolute assurance by Prof. Wilkes that in this matter of heat, gas fuel is the supreme agency.

During the year the students at Technology have prepared reports on many of the various gas apparatus now installed at the institution.

The course of 1923 will be given publicity in the student paper and announcements will be made to all classes having any relation to our industry. It is felt by the faculty that as a result some undergraduates will remain for this specialized work this year. No charge will be made to such students.

Importance of an early response from the iudustry is requested so that prompt enrollment may be made. This is absolutely essential. Only five weeks remain for final preparation. The tuition fee last year was $45 per man and it is expected that the same fee will be in effect this year.

Technology must be advised promptly of the actual attendance so as to provide adequate laboratory facilities.

It was the opinion of the Gas Sales Association that every person connected with the gas industry should do all they can to boost this Industrial Gas Sales Class.

Public Utilities Securities Market Report

Prices of Representative Gas Bonds

(Quotations furnished by The National City Company)

Company.		Maturity	May 24, 1923. Bid	Asked
American Lt. & Trac. Co.	Five Year 6s	May 1, 1925	105	106
Brooklyn Union Gas Co.	First Consol. 5s	May 1, 1945	95¾	96
Columbia Gas & Elec. Co.	First 5s	May 1,1927	96½	97½
Consol. Gas, Elec. Lt. & Pr. Co. of Baltimore	First Ref. 7½s	Dec. 1, 1945	110	111
Consol. Gas, Elec. Lt. & Pr. Co.	General 4½s	Jan. 1, 1935	91	91½
New Amsterdam Gas Co.	First Consol. 5s	May 1, 1948	82½	84½
Denver Gas & Elec. Co.	Gen. (now 1st) 5s	Jan. 1, 1949	93½	95
Detroit City Gas Co.	Gold 6s	Jan. 1, 1947	99½	99⅞
Equitable Illum. Gas Lt. Co. of Philadelphia	First 5s	Jan. 1, 1928	99½	101
Hudson County Gas Co.	First 5s	Nov. 1, 1949	93¼	94
Laclede Gas Light Co.	Ref. & Ext. 5s	Nov. 1, 1934	91½	94
Michigan Light Co.	First & Ref. 5s	Mar. 1, 1946	87	88¾
Milwaukee Gas Light Co.	First 4s	May 1, 1927	93¾	94¼
Pacific Gas & Elec. Co.	Gen. & Ref. 5s	Jan. 1, 1942	90½	91
Pacific Gas & Elec. Co.	First & Ref. 7s	Dec. 1, 1940	106½	108
Cal. Gas & Elec. Corp.	Unif. & Ref. 5s	Nov. 1, 1937	96½	97¼
Peoples' Gas Lt. & Coke Co.	Refunding 5s	Sept. 1, 1947	88⅝	89
Chicago Gas Lt. & Coke Co.	First 5s	July 1, 1937	91	92
Portland Gas & Coke Co.	First & Ref. 5s	Jan. 1, 1940	89	91
Seattle Lighting Co.	Refunding 5s	Oct. 1, 1949	81	83
Southern California Gas Co.	First 6s	Nov. 1, 1950	97½	99
Utica Gas & Electric Co.	Ref. & Ext. 5s	July 1, 1957	89	91¾
Washington Gas Light Co.	General 5s	Nov. 1, 1960	93	94⅛
Western States Gas & Elec. Co. of California	First & Ref. 5s	June 1, 1941	90	92

Dividend Announced

Boston, Mass.—F. N. Wrightington, treasurer of the Massachusetts Gas Companies, has announced the semi-annual dividend of 2 per cent upon the preferred shares of the companies, payable June 1, to stockholders of record May 15.

Files Annual Report

Visalia, Cal.—Central Counties Gas Company, serving most of Tulare County and having its headquarters in Visalia, had a net operating revenue for 1922 of $59,604.51, according to the annual report of the affairs of the corporation filed with the State Railroad Commission. The operating revenue was $200,407.80 and the operating expense was $161,-313.29.

The company, the report shows, declared a dividend of $6,501.52 for the year and had on hand at the end of the year a surplus of $2,966.53.

Since the first of the year the company's business has been showing a fine steady growth and new connections going in promise to exceed those of a year ago by a large margin.

Utility Reports Its Net Income

The Northern Indiana Gas and Electric Company, Indiana, one of the largest utility companies of the state, which furnishes gas to Wabash, has filed its annual report with the Public Service Commission, showing a gross income of $2,028,-943.91.

The revenues for the year were approximately $7,000,000 and the expenses, including taxes and depreciation, approximately, $5,000,000.

An 8 per cent dividend was paid on the $5,000,000 common stock and the dividends on $8,000,000 of preferred stock were $562,888.88.

Stockholders Elect Directors at Meeting of Gas and Fuel Co.

Lebanon, Pa.—Stockholders of the Lebanon Gas and Fuel Company at their annual meeting recently elected seven directors, who afterwards reorganized and elected the officers for the coming term. John K. R. Schropp and Thomas I. Carter were new directors elected, taking the places of Carl Hermann and the late Frank Frueauff, respectively.

Directors elected are as follows: Henry L. Doherty, Thomas I. Carter, John A. Bollman, John K. R. Schropp, Luther Gaston, J. Anson Wilhelm, and Walter C. Graeff. The reorganization resulted in the following officer elections: H. L. Doherty, president; T. I. Carter, vice president; Lutheran Gaston, treasurer and general manager; J. A. Wilson, secretary; Walter C. Graeff, solicitor; E. E. McWhiney, assistant secretary; and T. A. Wallace, assistant treasurer.

Plans Bond Sale

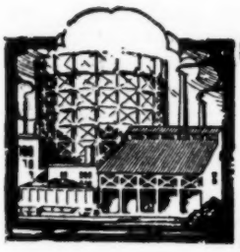
San Francisco, Cal.—The San Diego Consolidated Gas and Electric Company has applied to the State Railroad Commission for authority to issue and sell $1,438,000 par value of its first and refunding 6 per cent bonds, $550,000 par value of its first mortgage bonds, and $674,000 par value of its preferred stock. The funds derived from the sale of the bonds will be used for retiring outstanding securities and defraying costs of improvements.

Awards Contract

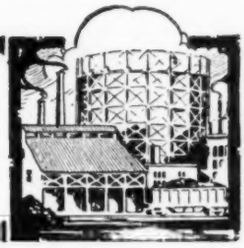
The Central Illinois Light Company of Peoria, Illinois, has awarded contract to the Gas Machinery Company of Cleveland, for a new 10-foot carburetted water gas apparatus.

The new water gas set will be installed in the existing building and alongside of the present set.

The new set will be complete with air and steam meters, automatic control and auxiliary equipment.



NEWS OF THE GAS INDUSTRY



Joint Meeting of Southwestern Public Service Association and South Central Gas Association, at Fort Worth, Texas

That common problems confronting men engaged in a common industry may best be solved by group discussion and interchange of ideas was one of the striking points brought out at the gathering together of public utility men of the Southwest, at Fort Worth, on May 15, 16 and 17, 1923, on the occasion of the nineteenth annual convention of the Southwestern Public Service Association and the eighth annual convention of the South Central Gas Association, meeting in joint session.

The Gas Section in particular demonstrated an interest in those problems that are just now puzzling gas executives of the Southwest, and followed with keen appreciation and enthusiasm the papers presented and the discussions that followed. The enormous waste of natural gas and its inevitable exhaustion, the problem of steel pipe corrosion, public relations, and the education of the public into a keener appreciation of the service rendered by the utilities, were all touched on, signifying to what a marked degree these men are keeping pace with the step of progress, and the attention that they are paying to the development of their companies along the highest lines.

The morning session was a joint session of the two associations. An address of welcome was delivered by the Mayor of Fort Worth, E. R. Cockrell. He expressed in well-chosen terms his pleasure in greeting a group of city builders such as the utility men represent, and his appreciation of the fact that the modern city cannot be built without these utilities. He suggested, as a means of minimizing that "can't get along without them, or with them" atmosphere found in some cities, a careful program of educating the general public to a more appreciative spirit regarding these utilities, and closed with a brief sketch of his city, and a "welcome from a Southern city, with a Southern heart, standing at the gateway to the West."

The feature of the session of the Southwestern Public Service Association, was the annual address of the president, R. J. Irvine. Mr. Irvine spoke of the obligation of the utilities to the public, and the importance of paying attention to the small complaint. He suggested taking the attitude that the customer is right, or at least honest, in his opinion, as a means of smoothing over difficulties, and improving public relations. Mention was made of the promotion of the sales of equipment as a source of additional revenue, the trend of his address taking educational lines, and touching the all important points of improvement of safety conditions in the small plant, the promotion of American ideals and public welfare, in relation to its application to the utilities.

The meeting was then turned over to the South Central Gas Association, with P. A. Nichols presiding. The annual address of the president of this association was delivered by the President, F. C. Armbruster. Mr. Armbruster, after introductory remarks, sketching the development of the gas industry, sounded a more serious note, and spoke briefly on the dangers to political controversy, the importance of proper returns, and the failure of the gas companies to bring the public to an appreciation of this point. He urged the securing of the public confidence on gas executives, and suggested as the big work of the members of the association clean, open methods of publicity. He further emphasized the importance of harmony within the plant. He also recommended the fostering of a speakers' bureau, and other measures of educational value, closing with an appreciation of the work of the association in building up the industry.

The Wednesday morning session was given over to group meetings of the various technical sections, and to a brief session of the South Central Gas Association, at which time the committee on the consolidation of that association with the Southwestern Public Service Association made a formal report. The merger will go into effect after this convention, and the general feeling is that the move will prove most advantageous, and result in much good to the association.

At the Wednesday morning meeting of the South Central Gas Association and the Gas Section of the Southwestern Public Service Association, two most important papers were presented, the one by W. M. Murphy, engineer for the Municipal Gas Company of Dallas, and the other by Henry Carsons, of the American Cast Iron Pipe Company, of Birmingham, Ala. Mr. Murphy, who has found the study of pipe preservation one of the most interesting studies relating to the gas industry, presented some most interesting points in regard to this problem, and in addition to his paper, a real contribution to the literature available on the subject of the protection of steel pipe from corrosion, had an interesting exhibit, showing the results of his theories and experiments.

The Wednesday afternoon session of the Southwestern Public Service Association and the South Central Gas Association, held jointly, took for its general theme

the all-important subject of public relations. That the public must be educated in the problems of public utilities in order to promote a better feeling in regard to these utilities and to capital in general, was expressed, and various means whereby this result might be brought about discussed.

The first speaker presenting views on this subject was H. C. Abell of New York, chairman of the committee on public utility information Bureau of the National Electric Light Association. Mr. Abell has had much experience along this line of promoting good feeling and better relations, and his paper, which appears in another part of this issue, presented many interesting situations.

He was followed by G. H. Clifford, of the Northern Texas Traction Company, of Fort Worth, who dealt with telling the utility story through the utility employee.

Mr. Tuttle gave a brief discussinn of the ways of presenting the utility story to the public through employees.

E. B. Shurter, of the University of Texas, spoke of the value of speaking and essay contests, to be held in the schools, as a medium of directing the students to a more thorough study of the utility business, and of extending this study and interest to the parent through the student.

Herbert Baker Flowers, president of the New Orleans Public Service Corporation, spoke briefly on this subject of getting the public utility message across, especially through the press. "Give the public square service, and above-board, dependable information about the utilities, and the public will give you a square deal," he declared, at the conclusion of his remarks.

The meeting was then turned over to the Texas Public Service Information Committee, with C. W. Davis as chairman, and the work being done by that group outlined. George McQuaid, of Dallas, the director of the work, spoke of the interest on the part of the public in public service corporations, as reflected by the seeking of information along these lines.

Wednesday's program was topped off with the annual banquet at the Texas Hotel, with W. M. Holland, of Dallas, as toastmaster. The speakers included F. C. Armbruster, of Shreveport, president of the South Central Gas Association, who expressed his belief that the Public Service Association would become a stronger, more vigorous organization as a result of the consolidation with the gas section. Entertainment features were provided that helped make this function the success that it was, and the banquet was followed with dancing.

The last day of the convention found the delegates as keenly interested as the first. The morning was devoted to special sessions of the various sections, with the gas delegation giving especial attention to the problems facing that industry. The event of the morning was an address by H. Mitchell Godsey, of the Southwestern Gas and Electric Company of Shreveport. High lights of this paper, which dealt with service to industrial consumers with natural gas, were the place on the staff of the natural gas companies personnel for the industrial engineer, and his service to the company and the community, the problems of the industrial engineer and how they shall be coped with in order to result in a maximum of satisfaction.

C. B. McKinney, of Dallas, was elected chairman of the Gas Section for the coming year.

The report of the resolution committee was read and adopted, as were also reports of various other committees. Joe H. Gill, of the Dallas Power and Light Company, was elected president; C. B. McKinney, of Dallas, first vice-president; H. E. Bolton, of Calvert, second vice-president; Geo. I. Plummer, of Dallas, third vice-president, and E. J. Gannon, Fort Worth, treasurer. The selection of a meeting place for next year, as well as the election of a secretary for the association, is left for the executive committee.

New members of the executive committee are: G. W. Fry, Abilene; F. M. Hoag, Dallas; E. T. Keck, Dallas; F. C. Armbruster, Shreveport; H. B. Flowers, New Orleans, and Joe Gill, Dallas.

The finance committee is composed of R. E. Lee, Houston; A. F. DeLoach, Galveston, and R. B. Boyle, Fort Worth.

Will Design and Construct Gas Plants and Equipment

The New York Engineering Company has recently entered the gas field, covering the designing and construction of complete gas plants and gas works equipment, including scrubbers, condensers, washers, purifiers, tar separating and storage tanks, coal and coke hoppers. They have extensive plate metal and machine shops located at Yonkers, N. Y., and are equipped with modern machinery, enabling them to perform high-class work, either riveted or welded.

This company has for many years been engaged in designing and construction of placer mining machinery, marine boilers, penstocks, digesters and equipment for sugar and oil refineries, etc. The plant is particularly well situated for both rail and water shipments.

The gas plant design and construction will be under the direct supervision of E. W. Steinmueller. On account of his thirty-odd years' experience in this work, Mr. Steinmueller is well known to the gas fraternity.

Organization Meeting Industrial Gas Section

The application to create an industrial gas section, presented in accordance with the provisions of the constitution and by-laws, has been ratified by a vote of the general membership of the American Gas Association.

An organization meeting of the Industrial Gas Section will be held on Wednesday, June 6, in Assembly Room No. 2 on the fifth floor of the Engineering Societies Building, 29 West 39th street, New York City, at 11:00 a. m. (Daylight Saving time).

Oscar H. Fogg, secretary-manager of the association, states: "Every member should realize the important part that the industrial gas section must take in the industry's future. It is hoped that there will be present at the organization meeting all of our members who are interested in industrial gas development."

To Get Service July 1st

Sheboygan, Wis.—Gas service will be extended to Sheboygan Falls and the fuel will be ready for use in this city by the first of July, officials of the Wisconsin Public Service Company here said recently. The village of Kohler is using the service from the mains that were installed last fall and this spring. And, judging from the pressure that is being brought to bear by the citizens of Plymouth, the extension will be made to that city within a short time.

With the completion of the high pressure line to Sheboygan Falls and the beginning of actual service there the Sheboygan plant of the Wisconsin Public Service Corporation will be supplying more gas than any other plant owned by the corporation in this state.

The establishment of the Sheboygan Falls line will give the Sheboygan system a total of nearly ninety miles of pipe lines in service, and it means an increase in manufacturing facilities at the plant here.

Last fall the high pressure main from here to Kohler, a distance of four miles, was completed, and the company is just completing the last house installation in the village. The homes in Kohler, as well as the Kohler company, now have the same advantages as those in Sheboygan.

Pipe and other equipment for the Sheboygan Falls extension has been ordered. Preliminary arrangements are completed, and it is only a matter of the arrival of material that is now holding up the progress.

A. F. Davey, manager of the Sheboygan plant of the Wisconsin Public Service Corporation, declared that 250 consumers have contracted for the use of gas in the city of Sheboygan Falls, in addition to the fuel that will be used for manufacturing purposes by the Falls Motors Corporation. And it is expected that by July 1 at least 100 of this number will be using it. The Falls Motors Corporation will use 7,000 feet of gas a day in testing motors and for heat treating purposes.

New generating equipment is now being installed at the central plant to supply the increased load that will result from the Sheboygan Falls extension. This new equipment will have a capacity of 500,000 cubic feet of gas daily. In addition to the generating system that is being added, the company, Mr. Lavey says, is planning on a greater storage capacity, to be provided for within the year. A new 150-horsepower boiler is also being installed.

The Sheboygan plant will be selling, with the additions soon to be completed, more gas than any other plant owned by the Wisconsin Public Utilities Corporation in this state, and the company operates plants at Green Bay, Marinette, Menominee and Oshkosh, besides the one at Sheboygan. Seventy-six miles of main is already in service in this city, as is four and a quarter miles to Kohler and including the Kohler distribution system. The Sheboygan Falls extension will be nearly three miles long and the Plymouth extension, which is a matter for the future, will be seven and a half miles more. That would give the plant ninety-six miles of pipe line altogether. The high pressure rural extension line would be fourteen and a half miles long.

The number of gas users in the Sheboygan and tributary territory is increasing almost daily, according to Manager Davey, and it will not be long before the corporation will not only be able to boast the most users in the state, but will be competing strongly with the biggest in the country.

To Erect Gas Tank

Little Falls, N. Y.—The Utica Gas & Electric Company will erect a large gas storage tank in Herkimer, to cost $150,000. It will give Herkimer an independent supply of gas sufficient for four days, holding 500,000 cubic feet. The Utica tank holds 3,000,000 cubic feet, the Little Falls tank 75,000 and the Ilion tank 100,000. The Herkimer tank will be 100 feet in diameter and 150 feet high. It will be located on land purchased from Mrs. Martha Manion, running through from South Main to South Washington Street. The foundation will be about five feet thick and require about five carloads of cement. The Newport Construction Company has the contract for the foundation.

Wants Higher Gas Rate

Hearing on application of the Richmond Light, Heat and Power Company, of Richmond, for authority to increase natural gas rates, was held before R. W. McCardle, chairma of the Public Service Commission.

New Storage Tank to Be Erected.

Yonkers, N. Y. — More than $300,000 will be spent by the Westchester Lighting Company on the erection and equipment of an enormous tank for the storage of illuminating gas on Saw Mill River road and Palmer avenue. Preliminary plans for the work were filed with Building Inspector J. Sims Bartley by the local superintendent, Edward O. Baxter.

Mr. Bartley stated that no objection will be made by his office to the erection of the tank. It is understood, he said, that no manufacturing of the gas will take place there, but it will be used only for storage purposes.

Billings Gas Company Wants Higher Rates

The Billings Gas Company, selling natural gas to consumers of the Sugar City, has filed an answer with the public service commission of Montana to the complaint of the city of Billings, which complaint asks for an order reducing the gas rates in Billings.

The answer not only denies the allegations of the complaint, but the company contends it has not been making a fair return on its investment under the present rates and asks the commission, instead of lowering the rates under the application of the city, to raise the rates to a point where the company can make a return of 12 per cent on its investment.

The Billings Gas Company alleges it buys its gas from the Gallatin Gas Company, which in turn buys it from the Midwest Refining Company, which operates a gas well 66 miles from Billings and in the state of Wyoming.

Recently R. F. McLaren, assistant secretary, and Chief Engineer Snell of the public service commission made an examination of the books of the Billings Gas Company for the purpose of informing the commission regarding the company's earnings.

Northern Indiana Co. Installing Automatic Stokers.

The U. G. I. Contracting Company, of Philadelphia, has lately received a contract from the Northern Indiana Gas & Electric Company to install Automatic Stokers in the boiler plant of its South Bend Works.

To Install New Equipment

The Gas Machinery Company of Cleveland, Ohio, are under contract to furnish a new 8-foot 6-inch cone top water gas generator, gas connections and auxiliary equipment to the Citizens Gas & Electric Company at Waterloo, Iowa.

The new generating equipment and increased size of gas connections will enable the gas company to increase its rate of make so as to properly take care of the growing business.

Gas Stove Exhibit

The Central Gas and Oil Stove Company, and Garfield W. Davis, both of Philadelphia, have arranged for displays in the Philadelphia Palace of Progress, a civic-industrial exposition to be held in the Commercial Museum here May 14-26. The exposition will celebrate the 240th anniversary of the founding of Philadelphia, and will represent the civic and industrial advancement of the city.

The Central Gas and Oil Stove Company will display gas and oil stoves, and Garfield W. Davis will exhibit gas appliances.

Moves Headquarters

Buffalo, N. Y.—The Jamestown Gas Corporation, Corry, Pa., manufacturers of an improved gas stove, will move to Buffalo in the near future. The corporation has been capitalized at $100,000, of which it is expected $50,000 will be paid in by the time operations are started in Buffalo. It is planned to lease a factory at first and later, as business warrants, the company will erect its own plant.

Gas Rate Order by Public Service Commission

Albany, N. Y.—The Public Service Commission authorized the Republic Light, Heat and Power Company and the Frost Gas Company, Inc., serving villages and towns in Erie and Chautauqua Counties, to establish a net rate of 60 cents a thousand cubic feet for natural gas, minimum rate $1 a month, effective June 1. The rate was fixed for one year and until further order, but with the understanding that the companies complete at least 20 new wells, drilling to begin at once, and that not less than $200,000 be expended until the daily production rate is increased to 15 million cubic feet. The commission further ordered that the cost of new wells is to be defrayed by earnings, not capitalization.

The order resulted from the companies' application for authority to increase the rate. At the hearing virtually every community opposed increases on the ground of inadequate service.

Gas Co. Elects Officers

Plymouth, Mass.—The annual stockholders' meeting of the Plymouth Gas Light Co. was held in Boston on March 26th, at which Charles Otten, Jr., who has been the manager of the company for the past four years, was elected to the board of directors. The stockholders re-elected Charles R. Adams as treasurer of the company and Edward C. Mason was re-elected clerk. A committee was also elected to choose an auditor.

At the meeting of the board of directors held on March 28th, Charles Otten, Jr., was elected president, which position had been vacant since the death of E. P. Rowell, several years ago. Bowen Tufts was re-elected vice president.

The board of directors now consists of Messrs. Arthur Lord, A. C. Bent, C. D. Parker, Harold B. Lamont, Paul B. Webber, Charles Otten, Jr., and Bowen Tufts.

Asks Meter Charge

Weston, W. Va.—The public service commission heard the application of the Keener Oil, Natural Gas & Fuel Company, of Weston, for authority to place in operation a minimum meter charge of 75 cents per month. It was the contention of the company that it has had no authority to charge a minimum rate and that it has 1,800 meters in service, six per cent of which are not used during six months of each year beginning April 1 and three per cent are stationary during the succeeding six months period.

It was stated that the increased revenue that would be derived under the change would be $742.33. Herbert M. Blair, of Weston, appeared as counsel for the gas company and C. W. Laughlin, superintendent of the company, was the principal witness. The protestants were not represented at the hearing.

Springfield Company Given About $275,000 Insurance

The Springfield Gas Light Company has been awarded an insurance indemnity of approximately $275,000, in full settlement for all damage resulting to its property from the explosion and subsequent fire which occurred at the company's gas plant on Water street, February 1, 1923.

Agreement upon the award was reached at a meeting at the headquarters building of the Springfield Fire and Marine Insurance Company of expert appraisers representing the 20 or more fire insurance companies that shared the insurance in the gas plant.

The terms of the award were at once conveyed to the officials of the Gas Light Company and by them were declared satisfactory.

Appointed N. Y. Representative

The Bryant Heater & Mfg. Co., of Cleveland, Ohio, announces the appointment of W. A. Buerkle Sales Co., 212 Livingston Street, Brooklyn, N. Y., as their New York representative.

The Buerkle Company has secured the services of H. D. Gillingham, who has had experience in the gas boiler business and is well equipped to handle heating problems.

Addition to Gas Plant Started

Pawtucket, R. I.—The Pawtucket Gas Co. has started work on the construction of the new $75,000 addition to their gas plant on Tidewater Street, this city. The addition, which will be built by the owners on the day work basis, will be of brick and steel construction, thoroughly fireproof, and will greatly add to the facilities of the company.

Rate to Remain Same

Saratoga, N. Y.—The price of gas in Saratoga Springs will remain $1.70 per thousand cubic feet, the Public Service Commission determined recently in reaffirming its decision.

The Adirondack Power and Light Corporation, which operates in Saratoga, had asked for a rehearing after the commission had fixed the $1.70 rate. The company alleged it should be permitted to charge a higher rate.